AVIATION WEEK

A McGRAW-HILL PUBLICATION

APRIL 3, 1950

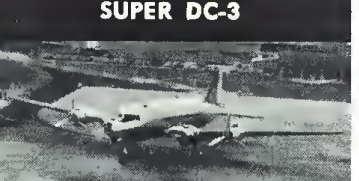
CONSTELLATION

DC-6

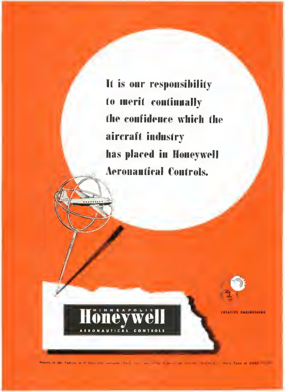
CONVAIR-LINER

202

SUPER DC-3



DC-4



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Aviation Week

Volume 52 **April 3, 1950** **Number 14**

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NEWS SIDELIGHTS

Etiquette For Omniranges

Now that CAA is getting more and more omniranges into use, instrument approach procedures are being established for them. Also being completed is a program to standardize the "cone" over VOR (very high frequency omnirange) stations to provide a radio fix for positions reported and holding patterns.

One of the first standards to be set is: The time of an aircraft over a station shall be taken when the "To-From" needle has completed its change in position.

Early importance of developing well-tested omni procedures is pointed up by the fact that it is expected the VOR stations will completely supplant the present low frequency ranges by 1953.

Ruffled Feathers

House Commerce Appropriations subcommittee's slash in Civil Aeronautics Board's 1951 fiscal year appropriation stemmed from what to many appeared Chairman John Rooney's (D., N. Y.) personal animosity against CAB Chairman Joseph O'Connell.

This is what happened:

The New York congressman started off the hearing by referring to "Mr. O'Donnell"—despite the fact that he has been consistently calling the CAB chief by his correct name since last year's hearings before his group. Next, he curtly interrupted a brief justification by O'Connell for 98 additional CAB personnel: "I think if you would direct yourself to telling us what you have done during the past year rather than what you expect to do with new people who I know now are not going to be approved, it would save time."

O'Connell: "You say you know now they are not going to be approved?"

Rooney: "I am quite sure of that, yes."

O'Connell: "Then it seems rather silly to be discussing anything that has been already decided."

The 111 pages of "hearings" that followed were an attack on CAB, with Rooney as prosecutor. Evidence of lack of coordination, laxity, and over-emphasis on trivia at CAB unearthed by Appropriations Committee investigators was presented by Rooney.

O'Connell unhesitatingly admitted considerable need for improvement in the CAB operation. But that these weaknesses hardly justified Rooney's sarcastic hostility was implied by Rep. Daniel Flood (D., Pa.) in his observation to O'Connell that the "atmosphere" might be due to "to somebody's tail feathers being ruffled."

O'Connell's speeches over the past year and CAB's annual report criticizing Congress for failing to give the Board adequate appropriations probably contributed to the "ruffling" of Rooney's tail feathers. Also, a current report is that a casual remark by O'Connell referring to New York congressmen who subscribe to the "ITT Club" (Into Washington on Tuesday and out on Thursday) was relayed to Rooney. This, too, may have contributed to Rooney's attitude.

Key RTCA Group 5

Insiders at RTCA say that 'working group 5" of the air traffic and navigation panel under leadership of Lt. Cmdr. A. W. Wuerker, USCG, and S. P. Saint of ATA, is the most important developmental aeronautical group since RTCA's Special Committee 31 which outlined the "common system" program.

The working group is charged with reviewing and developing operational requirements of the equipment to be used in the transition phase of the common system. This means literally specifying the "blackbox" equipment to be used in the air navigation and traffic control system of the immediate future.

Some of the equipment to be used is already in existence, such as radar, VHF radio and distance measuring equipment (DME). Other things to be developed include Automatic block system for traffic control which lights up signals in cockpit, private line communications, airborne radar and its place in the system, and application of television principles to navigation problems.

Wotson Transfer Blocked

Political maneuvers last week prevented transfer of the USAF Watson Electronics Laboratory from Red Bank, N. J. to Griffis AFB, Rome, N. Y., overriding Air Force Secretary Symington's recommendation in the "interests of defense efficiency and economy." (Political block of the shift was forecast in AVIATION WEEK Feb. 20.)

The transfer was effectively stopped, at least for the present, when the House Armed Services Committee voted, 12 Republicans to 11 Democrats, to keep the laboratory in New Jersey. Eight Democrats and two Republicans did not vote.

Actually the vote was a question of rejecting an Air Force request for $2,781,500 in the military public works bill, which was to have been used to modify buildings for use by the laboratory at Rome.

Symington had described the move as a first step in consolidating all USAF electronic activities at one base. Effect of the House action is to delay and hamper USAF research and development in the important field of electronics at a period when virtually all other aviation development timetables are keyed to the pace of electronic developments.

Riding Missile Range

The million-acre bombing and guided missile range established down at Holloman AFB, near Alamogordo, N. M., has created for the USAF some problems which have no obvious relation to missiles.

It seems that much of the land used was public domain on which cattle ranchers had acquired grazing rights. But the life expectancy of a little dogie on a bombing and guided missile range is not very good. Something had to be done.

So USAF has asked Congress for an allotment of $254,000 in the 1951 budget to repay the cattle ranchers for the loss of their grazing rights. Indications are that it is a fixed payment of about 25 cents an acre per year to be made every year as long as the grazing rights are suspended.

Finletter for Symington?

Washington rumors that Air Force Secretary Symington will accept chairmanship of National Security Resources Board have become so commonplace that acceptance will be anticlimax. Indications are that he will accept post effective May 1.

Predictions that Thomas K. Finletter will succeed Symington remain in doubt but continue to gain impetus. Pentagon comment is that acceptance by Finletter of Air Force secretaryship is doubtful because of failure of Administration to adopt Finletter recommendation for 70-group Air Force for which he is on record without reservation.

AVIATION CALENDAR

Apr 4-6—Engineering and Maintenance conference, Air Transport Assn., Hotel Continental, Kansas City

Apr 4-8—National Production Exposition, sponsored by the Chicago Technical Societies Council, Stevens Hotel, Chicago

Apr 6—120th National Aircraft Standards Committee western division meeting, Aircraft Industries Assn offices, Los Angeles, Calif

Apr 10-11—Second annual aircraft spraying and dusting conference, North Dakota Agricultural College, Fargo, N. D.

Apr. 10-12—Annual convention, American Society of Lubrication Engineers, Hotel Statler, Detroit

Apr 12—American Society of Mechanical Engineers Aviation and Gas Turbine division, Hotel Statler, Washington, D. C.

Apr. 16-20—Annual business meeting, American Assn. of Airport Executives, Ned House Hotel, Columbus, Ohio

Apr 17-19—1950 aeronautic meeting, Society of Automotive Engineers, Hotel Statler, New York City

Apr 24-26—Airport Operators Council third annual meeting, Hotel Carter, Cleveland

Apr 26—Stainless steel valve clinic sponsored by Cooper Alloy Foundry Co., Hotel Statler, Buffalo

Apr. 29-30—Fifth annual southeastern air show and exposition, Jacksonville, Fla.

May 3-4—15th National Aircraft Standards Committee national meeting, Aircraft Industries Assn offices, Los Angeles, Calif.

May 5-6—National intercollegiate air meet, Columbia, Mo.

May 12-13—Midwestern conference on fluid dynamics and meeting of American Physical Society (fluid dynamics div.) in conjunction with dedication of new mechanical engineering building, University of Illinois, Urbana

May 18-19—Annual meeting and third national forum of Corporation Aircraft Owners Assn., Hotel Statler, Washington, D. C.

May 18-20—Annual Meeting of Women's National Aeronautical Assn., Tulsa, Okla.

May 19-20—Seventh annual personal aircraft meeting, sponsored by Institute of Aeronautical Sciences, Lassen Hotel, Wichita, Kans.

May 22-23—Third annual air transportation conference, Purdue University, Lafayette, Ind.

May 23-24—40th National Aircraft Standards Committee steering committee meeting, Washington, D. C.

May 25-26—Aircraft Industries Assn. board of governors meeting, Williamsburg, Va.

May 25-26—8th meeting of council for military aircraft standards, Navy Dept., Washington, D. C.

May 25-27—Spring meeting, Society for Experimental Stress Analysis, Hotel Statler, Cleveland

May 27-30—Midwest soaring contest, State College, Miss.

PICTURE CREDITS

13—(upper) Boeing Airplane Co., (lower) Douglas Aircraft Co. 14—31ATS. 16—(upper) Wide World, (lower) INP. 20—NACA. 22—Avro Canada. 28—Dept. of Defense. 52—AA.

NEWS DIGEST

DOMESTIC

CAB has approved an interlocking relationship whereby Laurance S. Rockefeller, Eastern Air Lines' stockholder and director, would acquire control of Marquardt Aircraft Co., Van Nuys, Calif. Rockefeller indicated he would acquire the majority stock interest in Marquardt now held by General Tire & Rubber Co. He plans to put additional capital into the aircraft company. Rockefeller also has interests in Piasecki Helicopter Corp., McDonnell Aircraft Corp. and Reaction Motors, Inc.

Mockup Allison T-38 project has been sent to Convair to guide design of engine's installation in operational Convair Turboliners. It will also expedite work in the prototype's nacelle area. First Turboliner is being modified as a cargo plane, with reinforced flooring and large 6 ft. x 8 ft. cargo door on the left side. A modification kit, consisting of new parts suitable for revamping present Convair Liners for project power is now being designed and fabricated.

Three Beech YT-34 trainers have been ordered by USAF with delivery scheduled for June and July. Craft will compete in a general trainer evaluation and test program now being carried on by the AF.

Grumman Aircraft has been awarded a $7,536,694 Navy contract for the purchase of an undisclosed number of twin-engined Albatross utility planes. At the same time, Navy announced award of $1,000,899 contract to Collins Radio Co., Cedar Rapids, Iowa, for an undisclosed number of two-way aircraft radios.

Thunderceptor was chosen as most appropriate name for Republic XF-91 in a contest conducted by the company among its employees. Thunderstreak and Stratobolt were second and third place winners respectively. Names will be submitted to USAF for official selection.

First Grumman F9F Panther delivered to U. S. Marines went to VMF-311, El Toro, Calif., being initial replacement for the squadron's Lockheed TO-1 Shooting Stars.

C. V. Whitney has resigned as Undersecretary of Commerce, giving as reasons need for a rest and desire to return to private business. He said he has been away from his business activities for seven of last nine years since he joined Air Force in 1941. He hopes to leave his post by May 1.

Brig. Gen. Dale V. Gaffney deputy commander of the Air Force Proving Ground, Eglin AF Base, died at Oliver General Hospital, Fla. He was 56 yr. old.

FINANCIAL

Bell Aircraft Corp. reports profit of $204,142 on sales of $11,829,475 for the year ending Dec. 31, 1949. Backlog was in excess of $32 million. Employment is at a peacetime high of more than 4500.

Fairchild Engine & Airplane Corp. last week reported sales of $48,318,743 for the year 1949, with net earnings of $1,575,328. Unfilled orders, including letters of intent, were $80,100,000, and net working capital, $14,687,753. Earnings per share amounted to 68 cents, compared to 52 cents a share in 1948. Backlog of orders had increased $4,700,000 over the Dec. 31, 1948 backlog.

INTERNATIONAL

Trans-Canada Air Lines' record $4,317,594 deficit in 1949 has become a subject of debate in the Canadian House of Commons. The carrier lost $2,898,150 on its trans-Atlantic service and $1,419,444 on domestic Canadian routes. Combined deficit during 1948 was $2,933,240. Canadian Trade Minister C. D. Howe predicts a domestic profit for TCA in 1950 but continued overseas losses.

Canadian defense estimates total $425 million for 1950-51, plus $200 million for future years. Royal Canadian Air Force expenditures are up $31 million over fiscal 1949-50. Air power is getting more than 44 percent of the defense budget. RCAF has two interceptor squadrons operational, plans to add six more. There are 10 auxiliary squadrons, another will soon be activated. RCAF personnel numbers 17,240 officers and men.

Improved obstruction lights are planned for the hill tops near Santa Cruz Airport, near Bombay, India, scene of KLM Constellation crash last July 12 which killed 45. Deputy Minister for Communications stated that lack of funds prevented installation of permanent high intensity runway lighting and other night visual aids. Being studied are KLM's recommendations on lengthening and strengthening airport's east-west runway, provision of surveillance and GCA radar with moving target indicator.

Turkish airliner crashed into hill near Ankara airport during approach, killing all 15 aboard. It was Turkey's worst air disaster.

WHO'S WHERE

Changes

▶Northrop Aircraft—John W. Myers has been named a member of the board, replacing C. N. Monson who resigned in December. Kenneth P. Bowen, formerly asst. vp-manufacturing, has been appointed vp-manufacturing, replacing B. G. Reed who resigned early this year. Roland J. Pagen, treas. and controller, is now vp and director of finance and accounts, Asst. Controller George T. Johnson has been promoted to controller.

Earl D. Prudden, Ryan Aeronautical vp, has been appointed to the Calif. Aeronautics Commission, replacing David G. Fleet whose term expired in Dec.; Col. C. V. "Bud" Burnett, manager of Detroit City Airport since 1934, has been named to the new Detroit Aviation Commission.

William G. Street has joined senior staff of operations research office operated by Johns Hopkins University for the Army at Fort Lesley J. McNair, Washington, D. C.

▶Around the Airlines—Homer E. Strickler and Irwin Nye have been named editor and asst. editor, respectively, of American Airline' Flagship News. Julio A. LaMarche is special rep. for Braniff International Airways in Sao Paulo, Brazil, where the airline expects to inaugurate service as soon as the field is completed. Jerome D. Fenton has been appointed asst. vp in charge of industrial relations for Pan American. Charles J. Cole is airline's new Atlantic div. traffic manager. Peter A. De Maerel has been named commercial manager for Sabena in N. Y. C., and Willy Van Sittert is operations manager for the airline at N. Y. International Airport. Lars-Georg Romberg has been named tech. asst. to the president of Scandinavian Airlines System. E. L. Dare is new manager of air cargo sales for United Air Lines, succeeding M. P. Bickley who becomes eastern regional manager of sales. J. B. Miller has been appointed UAL's district sales manager in Washington, D. C. Slossen E. Vail has been promoted to advertising production manager of Western Air Lines.

George M. Dixon has been chosen as new manager of airport development for San Francisco Public Utilities Corp.

Percy A. Johnson is Grand Central Airport Co.'s new executive vp and general manager. He had formerly done managerial work for the company at its branch locations since early '43.

John V. Weesner and Reginald E. Ross have been appointed new directors of Turner Airlines, filling vacancies created by resignations of John P. Moore, and Samuel J. Solomon. Mr. Weesner has also been made vp and K. Robert Hahn, secretary.

Honors and Elections

Charles H. Colvin, vp, manager of operations and director of G. M. Giannini Corp., has been elected a director of the board of Walter Kidde & Co.

INDUSTRY OBSERVER

▶Swept-wing turboprop version of the B-36 bomber now under discussion between USAF and Convair would be a tractor plane for two reasons: problem of sweeping back wing is simplified by change in powerplant installation, pusher turboprop installations are not preferred because of complications when the propeller shaft is run back through the tailpipe. To power the B-36, bigger turboprops than either the Allison T-40 or the Pratt & Whitney PT-2 may be developed from more powerful turbojets now available.

▶By fiscal 1951 Air National Guard expects to have as many jet squadrons in operation as it has fields from which they can operate safely. With 116 F-80s and 79 F-84s already in ANG squadrons, the program of replacement of piston engine fighters with jets is moving forward, subject to limitations of USAF procurement funds. Program contemplates equipping ANG units also with North American F-86s and Lockheed F-94s.

▶An 11-ft. drameter Aeromatic propeller is being developed for the four-place Helioplane prototype. A V-belt drive from the Continental 145-hp. engine will provide gear reduction ratio of more than 2-to-1 between engine and propeller rpm.

▶Under a modification suggested by Pratt & Whitney, USAF has allocated $5,347,000 in fiscal 1951 for modernization of 325 Wasp Major R-4360 engines used in earlier B-36 intercontinental bombers. Change includes improved crankcase, lengthening the master rods, lengthening the skirt of the cylinders to accommodate the longer master rods (aimed at giving an improved centrifugal loading on the main bearing), and additional cooling fins around the exhaust.

▶Forty-passenger version of the Vickers Viscount turboprop transport is scheduled to fly for the first time in July. Meanwhile the prototype Viscount continues demonstration flights, and a turbojet-powered Viscount, fitted with two Rolls-Royce Tay engines instead of the four Rolls-Royce Dart turboprops which are the usual powerplants, has already made its first flight.

▶USAF helicopter investigations at Langley Field indicate that unstable rotor damping must be solved through a rate giro applying opposite cyclic control in rolling or pitching, or by offset flapping hinges or some other special device before helicopters go into speed ranges higher than the present 125 mph. region.

▶Naval Research Laboratory is investigating potential aircraft fire hazard of vibration between electric cables and the framework to which they are attached. Researchers see possibilities of an intermittent contact through vibration which would be so brief as not to blow a circuit breaker or fuse, but which if continued might result in arcing sufficient to cause a fire. Remedy being sought is more effective circuit breakers.

▶A turboprop version of the six jet Boeing B-47 medium bomber is the newest turbine-propeller combination under study by USAF.

▶Watch for Jackie Cochran (Mrs. Floyd Odlum) to try for some new world records soon in her latest P-51 Mustang, which she recently obtained from film star Jimmy Stewart. It was the Mustang which Joe De Bona, under Stewart's sponsorship, flew to win the 1949 Bendix Race.

▶No. 1 Piasecki all-metal HRP-2 helicopter has been delivered at Patuxent Naval Air Station for Phase II tests, and the second and third of the model are already flying in preparation for delivery soon to the Marines at Quantico.

▶MATS fleet of 10 Lockheed C-121 Constellations is being modified to increase gross weight from 105,000 to 107,000 lb. As a result of the increased gross, MATS is now scheduling nonstop trans-Atlantic flights from Westover AFB to Frankfort.

▶Completion of the transition phase of the all-weather RTCA program probably will be postponed a year, to 1954, as a result of the Congressional cut of $25 million, CAA Administrator Del Rentzel believes.

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AVIATION WEEK

April 3, 1950

Transport Productivity on Long Haul

Plane Type	Daily Utilization	Length of Route	Block-to-Block Speed With Necessary Stops	Payload (Tons)	Ton Miles Produced	Flight Crew	Gallons Fuel Used	Ton Miles Per Man	Ton Miles Per Gallon
DC-6 or Constellation	10 hr	2500 mi	285 mph	12 5	35,625	5	2350	11-875	15 2
DC-4	10 hr	2300 mi	200 mph	10	20,000	2	2000	10,000	10
Convair or Martin 2-0-2	10 hr	2300 mi	270 mph	5	13,500	2	1185	6,750	11 7
DC-3	10 hr	2500 mi	140 mph	3	4,200	2	900	2,100	4 7

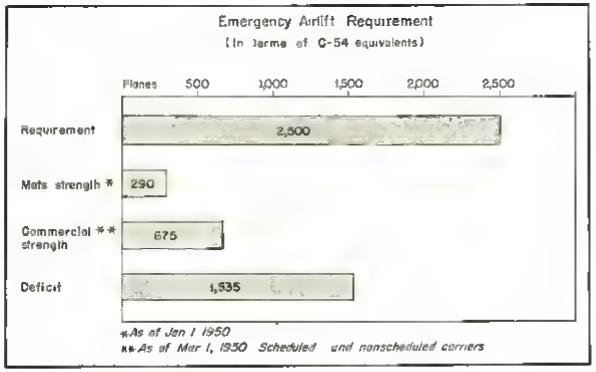
Airlines' Mobilization-Day Role in Dispute

Carriers and military argue over details of emergency planning.

By Charles L. Adams

How far should the military be permitted to go in taking over the airlines during a war time emergency?

That's the knotty problem facing national defense planners as they ponder the air transport industry's M-Day role. Working through its Air Coordinating Committee, the government has obtained agreement on the broad outline for airline mobilization, but civilian and military interests are still clashing over highly-important details.



▶**Deficit in Airlift**—Crux of the civilian military conflict is the deficit in airlift which would become immediately apparent in an emergency. The Military Air Transport Service has estimated that even if it took over all the strategic aircraft (four-engine planes) of the commercial airlines it would have no more than one-third of the capacity which it requires, and possibly only one-fifth.

Airline officials concede there is a serious deficit in M-Day airlift, but they contend it is being aggravated by the military's failure to cooperate in efforts to build up the commercial fleet. Further, the carriers believe the government will be making a major mistake if it permits the military to operate the domestic air routes in wartime.

Final decision on disposition of the commercial air fleet during an emergency rests with the National Security Resources Board which advises the President on coordination and maximum utilization of military, industrial and civilian facilities and manpower for war. NSRB already has the Air Coordinating Committee's general program for airline mobilization policy and now wants specific recommendations.

▶**Details Studied**—Agencies represented in ACC (Departments of Defense, State, Treasury, Post Office and Commerce, the Civil Aeronautics Board and the Budget Bureau) are working on these details, which include an organizational plan for a wartime government air transport agency, setting up standard contract procedures for military use of civilian equipment, and establishing a system of wartime priorities for passengers and cargo.

Many of these projects are of continuing nature, requiring constant modification in keeping with changing conditions. Recently, CAB submitted an extensive study in which it estimated the portion of the present commercial air transport fleet that must be retained to provide minimum civilian service during an emergency.

▶**MATS Strength**—Meanwhile, Maj Gen Laurence S. Kuter, MATS commander, presented to a closed session of the Senate Commerce Committee an estimate of airlift requirements and availability as prepared by the Joint Military Transportation Committee of the Joint Chiefs of Staff. This study plots the military's airlift needs in terms of C-54 equivalents and rules out twin engine equipment because of their inadequate range.

MAT's current strategic airlift capacity is not impressive and has changed little during the past 18 months. As of Jan 1, 1950, it had 1 Douglas C-118 (DC-6), 10 Lockheed C-121 Constellations, 7 Boeing C-97 Stratofreighters, 10 Douglas C-74 Globemasters and 230 C-54s.

Giving appropriate weight to the larger aircraft, MATS has about the equivalent of 290 C-54s in its transport fleets. In addition, it considers "available" some 30-40 C-54s currently used in medical air evacuation, special missions fleets, command administration and support, tests, and research and development throughout the Navy and Air Force. There are no four-engine transports in "mothballs."

The MATS fleet is being modernized slowly as more C-97s are delivered to replace C-54s. Some of the Douglas C-124s (capable of carrying 25 tons of out sized cargo) which the USAF now has on order probably will go to MATS.

MATS has estimated its emergency needs at 2500-4000 C-54 equivalents—requirements varying sharply in accordance with the mission envisaged. Thus even with the civilian reserve, an emergency airlift deficit ranging upward from 1000 planes is apparent.

▶**Civil Fleet**—As of Mar 1, 1950, U. S. domestic and international airlines, including large nonscheduled operators, had a fleet of 110 DC-6s, 264 DC-4s, 76 Constellations and 43 Stratocruisers. That's the equivalent of roughly 675 C-54s.

The airlines' four-engine strength grew about 20 percent during the past year and is continuing to expand at a somewhat slower rate.

It is assumed that during wartime most U. S. international routes would

BOEING C-97A, about 50 of which are on order, will help modernize MATS fleet as they are delivered. This and the larger

DOUGLAS C-124, some of which MATS will get from the USAF order for 66, will still leave a big deficiency in airlift requirements

MATS KUTER Estimates requirements

be operated either directly by the military or in part by the airlines under contract to the military Domestically the commercial carriers hope to preserve their identity

▶**Twin-Engine Craft**--Even if all the airlines' four-engine aircraft were taken over by the military, there would be close to 800 twin engine aircraft available for domestic and territorial commercial use This includes 137 postwar Convairs and Martins, plus 100 high-capacity C 46s, many of which are now being used for cargo flights

By contrast, only 166 twin-engine aircraft (almost all DC 3s) were left with the scheduled domestic airlines a year after the start of World War II

Domestic and territorial passenger traffic is now more than four times the 1941 level But the present twin engine fleet would give more than seven times as much lift capacity as the civilian fleet remaining after the military takeover in 1942

▶**Long-Haul Needs**--The civilian airlines hope to keep some of their four-engine transports for long haul domestic routes, including the transcontinental link They want up to 100 four-engine transports for this purpose and CAB is understood to favor the request in part

The airlines point out that during wartime most of their traffic will be high priority passengers or cargo of military importance They assert this will take a burden from the military fleet Besides they declare commercial plane utilization (as proved in the last war) is higher than military use so planes operated domestically by the airlines will be a net gain for the war effort

▶**Modifications Seen**--MATS doesn't lump all the four engine commercial aircraft together as being immediately usable in an emergency In fact it classifies less than 10 percent of the airlines strategic aircraft as 'available and usable with minor modifications'

These 'available' aircraft include many of the 65 cargo and combination passenger-cargo C-54s now operated by the certificated airlines plus a dozen or so other freighters used by such cargo carriers as Seaboard & Western Airlines and Transocean Air Lines While commercial cargoplanes have the necessary heavy floors and large doors, a number of them would have to be equipped with navigator facilities additional fuel capacity and CW radio for overseas duty

Balance of the civil fleet is classified by MATS as usable only after 'major' modification However airline officials believe MATS will not be so finicky over modifications if a serious emergency arises

▶**Military Attitude**--The airlines see a tendency in the military to discount the value of the civilian airlift reserve even though MATS would claim all the strategic aircraft in this reserve if war came

Airline and CAB-backed plans to strengthen the commercial fleet through a prototype development program were torpedoed early this year by the Budget Bureau Secretary for Air Stuart Symington indicated the USAF would like to have new long range cargo and transport aircraft suitable for commercial and military use, but he said available funds are needed more urgently for combat planes

The Air Coordinating Committee is now seeking Budget Bureau approval for a less-expensive prototype testing program under civilian control

▶**ATA Recommendations**--Besides favoring a prototype program, the Air Transport Assn has recommended these steps to reduce the M-Day airlift deficit by increasing commercial traffic

- **Acceleration of the SC-31** all weather electronic airways program
- **Carriage of all long-haul** first class mail and parcel post by air
- **Carriage of a greater share of** government passenger and cargo traffic by air
- **Encouragement of international** travel by U S residents

USAF backs these objectives since their implementation would not cut into the military budget

ATA also suggests a modified equipment "mothballing" program Under it the government would stimulate the flow of new aircraft types into commercial and military operating fleets by purchasing obsolescent but still usable planes

The former military and commercial workhorses modified for long range carriage of heavy cargo would be hangared and maintained in readiness by private maintenance firms thus bolstering fixed-base operators many of which need the business badly

▶**Airlines Worried**--What disturbs the airlines is talk of a complete takeover of all commercial aviation resources in wartime--regardless of current plans to the contrary--and a suspicion that MATS would like to build up its own operating strength rather than depend on the civilian reserve Although a compromise was reached within the Air Coordinating Committee by Department of Defense and civilian interests, it is known that MATS has prepared and submitted to the Secretary of Defense an "ideal' mobilization plan from MATS point of view

MATS, ATA emphasized, should be kept as a "nucleus" organization It should not be permitted to grow to such size that it will compete with the commercial airlines--even for government traffic

ATA is under no illusions about the whole mobilization picture It realizes that almost all existing plans may have to be discarded An attack on Alaska, for instance, would probably bring a demand for the airlines' twin-engine as well as four engine equipment

But ATA is determined not to be caught without a program Since 1947 it has been making studies which will help CAB set up an efficient commercial war service pattern with the equipment, personnel and facilities left to the carriers during an emergency

Convair 'Frees' Airfleets Subsidiary

Airfleets Inc, wholly owned subsidiary of Consolidated Vultee Aircraft Corp is going to be turned out into the world on its own

Airfleets was formed more than a year ago by Convair to develop a leasing arrangement whereby Convair-Liners would be made available to those airlines desiring such equipment and needing financial help for its purchase Despite ambitious plans which contemplated Reconstruction Finance Corp loans to provide the bulk of the capital, no business materialized

The company has evidently since become a respository for those assets of Convair which were not immediately productive, earnings wise, or were not associated with the company's main military production activity

▶**Airfleets Assets**--The assets now owned by Airfleets, Inc, consist of the former Convair property at Vultee Field, Downey, Calif, Stinson plant at Wayne Michigan 85 Stinson planes and spare parts notes of Piper Aircraft Corp having an unpaid balance of about $116,000: 100 000 shares of common stock of Piper 15 Convair Liners, and $75 000 in cash

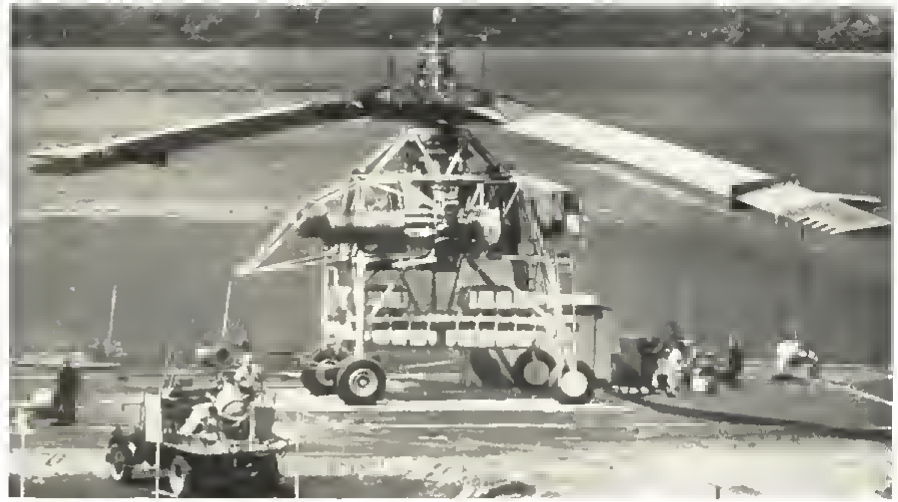
Convair assigned a total book value to all of these assets so transferred of about $8,500,000 In return, Convair received from Airfleets its notes aggregating $6,825,000 and the 235,000 shares of common stock outstanding for Airfleets

▶**Technical Separation**--By declaring a dividend of one tenth of a share of common stock of Airfleets for each share of Convair held, the Convair management is, technically, setting Airfleets free as an independent publicly held company The dividend was paid to Convair stockholders on March 31 to those of record on March 13

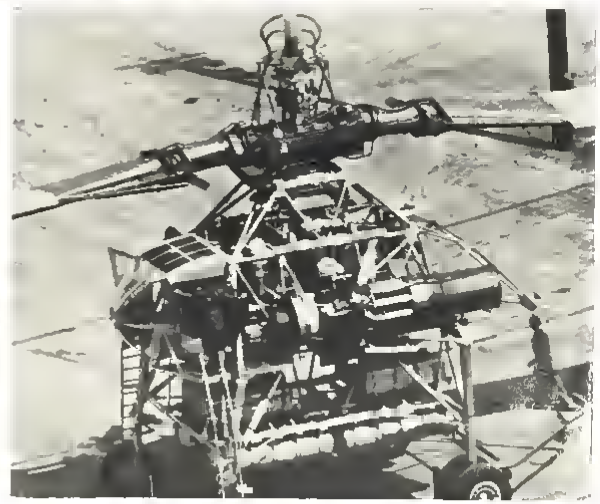
Actually, however, with the Atlas Corp owning more than 18 percent of Convair's common stock, it will also own and, presumably control a like percentage of the Airfleets' common stock equity The book value per common share of Airfleets is indicated at around $7 10 Yet, instead of issuing fractional shares Convair will pay cash at the rate of only $4 50 per share

It is probable that Convair is setting Airfleets free so as not to be burdened with non earning assets, hence making its main production activity appear more profitable Moreover, with a recent change in the company's bank loan agreement, Convair will now be able to pay a cash dividend later this year

▶**Liquidation Possible**--The very nature of its assets now puts Airfleets Inc in a position to undertake a gradual liquidating process if desired



XH-17 'Flying Crane'

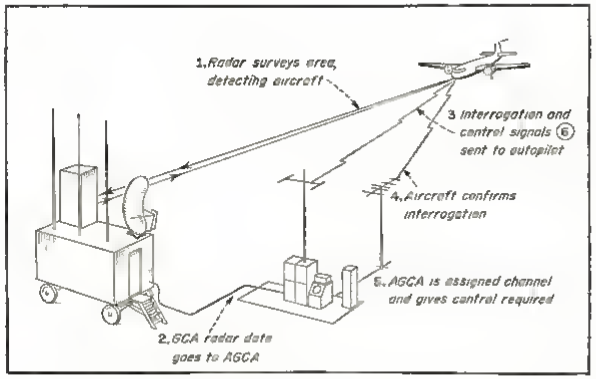


Hughes Aircraft last week removed wraps of secrecy from its jet powered XH-17 helicopter when it was rolled from the hangar and into full public view from the highway for its first ground tests

The full scale test ng has been completed for sometime and has undergone exhaustive tests

Twin General Electric J-35 engines, normally rated at 5000 lb thrust, drive 136-ft- diameter rotor Following ground tests the platform will be made flyable and flight tested A new prototype flight test is scheduled under current USAF planning for 1953 after purchase of copter from fiscal 1952 funds

XH 17 was designed to meet Army need for short-haul of heavy equipment such as tanks and artillery across terrain hitherto impassable Photos give general idea of craft's huge size, with cockpit apparently located about 20 ft from ground Craft could also be used to move Fairchild C 120 packplane pods from rear echelon supply areas to forward dispersed areas



AGCA Radar Clears Way for Jets

New automatic landing approach system handles six planes at once; gives rapid all-weather operation.

By Ben S. Lee

A new automatic landing approach system—automatic ground controlled approach radar—which is capable of handling landing approach of six aircraft simultaneously, promises an early end to present inclement weather landing hazards. It overcomes a major obstacle in the path of commercial jet-transport development and provides the means of making military combat aircraft "all-weather."

In tests conducted at Los Angeles Ontario Airport last week two aircraft equipped with Gilfillan AGCA systems in demonstration for military officials were regularly brought to within 50 ft. of runway touchdown by autopilot controlled by signals transmitted from a ground AGCA installation without human aid.

► **Automatic Landings**—At the 50-ft. point, control was assumed manually and the planes were set down by pilots of the respective planes. While completely automatic landings have been made during test development, landings were experimental in nature and are at present outside the realm of design intent.

Automatic GCA, briefly, is a new circuit system added to conventional GCA ground equipment. The circuits, from radar signals received on the ground, automatically measure distance of the aircraft from touchdown, its position (to left or right of course) and up and down from glide angle. It automatically provides continuous electronic control signals to incoming aircraft to point of touchdown.

Rapid control of military jet aircraft traffic during all-weather operation is a vital factor in national defense strategy. Stacking during inclement weather by numbers of jet craft is a situation scrupulously avoided. It often cancels out jet planes other all-weather capabilities. Eventual adoption of AGCA equipment by fighter craft or commercial jet transports, in effect, will also increase range since exceedingly rapid approach and landings may be accomplished with the system.

► **Eliminates Human Error**—Advantage of AGCA lies in the fact that it eliminates human control error factor both in the air and on the ground. Secondly, it increases airport air traffic capacity through ability to control sequentially the landing approach of up to six aircraft simultaneously.

Prime feature of the multi-framed radar robot is that it combines the three present landing approach methods into a single system.

- **Controls landing** approach automatically of aircraft equipped with autopilot.
- **Talk-down landing** provided simultaneously for aircraft without autopilot, or with malfunctioning airborne equipment.
- **Activates ILS** cross pointer meter for cross-check or manual control if desired by the pilot.

The airborne AGCA equipment is compact (not much larger than a shoe box) and weighs 7 lb. It is designed for operation on a single radio frequency to meet military specifications for fighter aircraft concerned with weight economies. Requirement for light weight when the equipment is available commercially, will prove of value to the private pilot. With the compact system the private pilot will be able to obtain automatic landing service at a cost far less than present price and weight cost of ILS equipment.

► **Tower Monitoring**—Operationally, the measurements are made automatically and monitored by a tower controller as incoming aircraft are displayed on the cathode ray tubes. By reading four meters the control tower operator is able to watch the distance of the plane to touchdown, speed, number of feet the plane deviates from right or left of path, and the number of feet the plane is above or below the proper glide path.

In multi-plane approaches, as craft are picked up on ground scope, data are transmitted and automatically set a predetermined traffic-control distance separation. In the event of an impending overtake, succeeding plane is given an automatic wave-off and the next plane in pattern is given corrective settings. Wave-offs are also automatic in the event of mal-functioning of the airborne equipment, failure of the craft to respond to ground control, or if plane gets outside of safe landing limits.

► **Traffic Capacity**—Because it is mobile, AGCA can utilize several runways which, under instrument conditions, is often vital because of shifting wind conditions. At the same time AGCA can serve parallel runways simultaneously. This is tantamount to increasing traffic capacity by reducing time separation for actual landing time required.

Additional safety factor of the system in operation is that bulk of equipment is on the ground where maintenance is continually at hand. Safety check features built into equipment make it impossible, however for the system to cause an unsafe condition. For instance if the aircraft is performing badly or if it varies past unsafe limits, a warning light glows and a bell rings notifying the pilot.

► **Self-Check Operation**—Ground equipment is also circuited so that it checks on itself continuously. If the system is not performing properly an automatic wave-off is transmitted. A final check of course, is provided by the control tower operator who can scan visual AGCA meters cabled to the tower from the mobile equipment.

There are imperfections which can occur in coupling units or in the autopilot for which there is no present desirable safety check in an ILS system. For example, under ILS a condition could develop whereby an aircraft could keep coming in despite dangerous deviation from glide path. Similar conditions are impossible under AGCA because the radar operated circuits determine any deviation immediately whether caused by equipment error or by drift and automatically transmit a correction signal.

► **R&D Board Requirement**—Air Force predicts that completion of development tests this fall will result in an immediate quantity production contract because of military necessity. Joint Chiefs of Staff have approved a Research and Development Board requirement that certain categories of combat craft be equipped for completely automatic flight by 1955.

Experiments are already under way by Air Materiel Command at Watson Laboratories, Red Bank, N. J., to handle the final 50 ft. of descent to touchdown. This system envisions switching control of an aircraft at 50 ft. altitude to an altimeter measuring height of the aircraft to the ground. Through altimeter control, the throttle is cut back on predetermined rate of descent speeds as the plane approaches touchdown.

The method results in the aircraft flying in a curve of space which is flared out as the plane approaches touchdown. Should a gust of wind throw the plane up or down a few feet, touchdown objective is automatically reset and correction control signals transmitted.

► **Eliminate Flare-Out**—Eventually need for flare-out altimeter control will be eliminated. Present test equipment makes its use mandatory. Research is being conducted to replace flare-out system with reverse altimeter control. This is a precise ground radar to measure and set rate of descent. Advantage of the equipment is:

- **Extra equipment** in the aircraft is eliminated.
- **Ground controlled** system is usable over rough terrain where the altimeter method is now useless.

► **Advantages**—Summing up, AGCA has these outstanding advantages:

- **AGCA can handle** all aircraft having any degree of instrumentation (talk down control for unequipped aircraft, zero reader control for aircraft having zero reader; fully automatic course and glide path control for aircraft having AGCA units and autopilots).
- **Traffic capacity** of up to six aircraft simultaneously on a single channel.
- **Automatic monitoring** of safety of all aircraft on approach, supplying a "go round" signal when a hazard develops (overtake or missed approach).
- **Vocal instruction** in case of emergency by human monitor.
- **Control signals** to any aircraft on approach are entirely independent of effects on other aircraft.
- **Parallel runways** can be served simultaneously by single AGCA equipment—vital factor in military operations or for commercial traffic control.
- **No special equipment** receiver required in aircraft. Regular VHF or UHF communications receiver and transmitter, standard electrical input autopilots, plus seven lb. AGCA unit is all that is required.

Turboprop is Step Before Jets

Convair data indicates economic value of turboprop versions of existing transports as intermediate step.

By Alexander McSurely

Engineering data already developed by Consolidated Vultee in its Allison-powered Turbohner project supports two economic conclusions:

- **Turboprop modification** of existing transport airframes provides the intermediate step toward long range turbojet transports.
- **Creation of category** of propeller turbine transports for short and medium range flights is justified as economically solid.

Analysis of the general turboprop transport picture in these terms was made by W. C. Keller, Convair engineer at the recent IAS flight propulsion meeting at Cleveland.

Supporting his conclusions with definite figures on performance expected to be achieved when the first turboprop Convair-Liner flies this summer, Keller reported:

- **First airplane** will have a gross weight of 41,200 lb., will cruise at 310 mph. at 16,000 ft. at 75 percent rated power and will have 350 mph. top speed at same altitude.
- **Sea level rate** of climb is 1940 ft./min.
- **Service ceiling** is 32,500 ft.
- **Takeoff distance** over a 50 ft. obstacle, is 2150 ft.

Unit to be used in the engine, the Allison Model 501 A2 (T 38), is a turbine section and a propeller reduction gear housing joined by an interconnecting tubular structure. Later models will have the interconnection replaced by a structure that is more compact and more efficient.

► **Reduction Gear**—Propeller to be used is a four-blade Aeroproducts steel propeller of 13 ft. 6 in. diameter. Gearing is 12.5:1 resulting in a propeller rpm. of 1146 for a turbine speed of 14,300 rpm.

The present 501 has a static rating of 2550 shaft hp. and 415 lb. thrust with a 2750 hp. equivalent shaft power rating at takeoff speed. Dry weight is 1225 lb. resulting in a lb. per hp. figure of .448. It is expected that the power of the 501 will be substantially increased with negligible weight and space changes as a result of further developments now under way.

► **Low Weight**—Allison has stated that with a regular production schedule the 501 engine can be produced for the same cost per pound that applies to any other engine of similar power. This brings the conclusion that the low weight per hp. would lead to lower costs for turboprops than for piston engines of equivalent power, or that higher-powered turboprop engines could be purchased, weight for weight and dollar for dollar, as against piston engines.

The Convair installation results in a weight saving in the General Motors plane installation of 1400 lb. Substantially the same thrust line is maintained as in current Convair-Liners, by locating the centerline of the propeller below the turbine axis, and laying the turbine and tailpipe over the wheelwell and wing structure.

Identical firewall contour of the 240 is being retained as well as the basic nacelle lines aft of the firewall, modified only for the tailpipe change. This design makes possible a future program of issuing conversion kits to airlines operating piston engine Convairs.

► **Engine Mounting**—Engine mounts at three points, two attached to the monocoque forward section of the nacelle, the third at the compressor section attaching to the firewall. Air is ducted directly to the turbine from a scoop in the top of the nacelle, while turbine exhaust is directed into the tailpipe with an aspirating connection.

Combustion heaters for wing and tail anti-icing are supplied because of low engine heat rejection. Two heaters in each nacelle get air from the oil cooler duct, while heater exhaust also goes into the tailpipe.

► **Oil Cooling**—Oil cooler air is ducted to the cooler, then dumped overboard. Major oil cooling requirements are for gear box lubrication with only about 30 percent required for the turbine.

Large center door in bottom of nacelle makes engine readily accessible, with floor of the turbine compartment similarly hinged for quick access. Fluid, electric and control lines have quick disconnect fittings.

Compressed air supplied by an AiResearch gas turbine compressor does the starting.

Powerplant controls have been designed by Aeroproducts for Allison, and are primarily electronic. Development continues on the control although it is indicated satisfactory. A single power lever in the cockpit controls each turbine. However, the first Turboliner will have alternate means of separately controlling propeller and turbine in addition to the automatic control.

► **Taxi Control**—Taxiing control is by propeller pitch change rather than rpm since idling speed of the turbine is close

to the top speed produced by the engine.

An alternate nacelle configuration also will be studied by Convair and Allison. This uses the entire nacelle as a plenum chamber with air supply from an annular inlet about the propeller spinner.

Range payload curves indicate a substantial gain for the turboprop for short and medium ranges, with the bonus of lower powerplant weight effective until higher fuel consumption and range cause a reversal in advantage beyond the 400-mile range.

► **Operational Factors**—Study of operational economics indicates that there will be no change in engine price on a conservative assumption, and that maintenance costs will be about the same, with maintenance life between overhauls expected to be as good or better than piston engines, after initial service test difficulties are experienced.

Turbine wheel temperatures directly affect power output and specific fuel consumption, and inversely affect time between overhauls with an overlying trend of improvement expected for all three.

► **500-Hr. Overhaul**—It is expected that improvement in maintenance time will reach a point where turbines can obtain 500 hr. maintenance spans soon and should considerably exceed this figure by the time the 501 is commercially available. Line maintenance on jet engines is already lower than for piston engines, and major line maintenance item on the turboprop is expected to be the propeller controls. Absence of vibration is expected to alleviate airframe maintenance problems.

Fuel costs of 12 to 14 cents a gallon for kerosene or the standard jet fuel ANF 58, with higher heat content of kerosene adding to economy of its use are compared to a 20 cents a gallon gasoline cost. It is expected that savings accomplished will justify logistics of the additional fuel supply.

Reports that turbine engines suffer more than reciprocating engines in hot day performance are confirmed, but in the case of the Convair-Allison project it is concluded that net power available is still higher than that of comparable reciprocating engines. Hot day power loss can be minimized by water injection now under consideration.

'Operation Swarmer' Will Test Planes

USAF participation in the 600 plane Operation Swarmer to be conducted at Ft. Bragg, N. C., late this month will be two-fold in scope.

• **Crystallization of planning** for aircraft requirements will be real undercover goal of USAF based on tactical performance of aircraft participating in the operation. Air Force will base fiscal 1951 aircraft procurement of seven types of planes on a top-level evaluation of swarmer performance.

• **Air Force tacticians** hope to settle once and for all the hotly debated question of USAF ability to provide effective logistical and tactical support of ground troops during the maneuver in actual establishment and support of an airhead.

Lt. Gen. Lauris Norstad, USAF's top strategist, designed the 40,000 man problem which will place every current combat type production aircraft except the intercontinental B-36 into competitive evaluation. Among the transport types which will fly in support of Swarmer are the C-119, C-82, C-74, C-54 and C-46. Fighter types which will come in for tactical evaluation are the F-86, F-84, and the RF-80, plus a number of B-45s and a token representation of B-47s.

Some 600 planes comprising ten different types of combat production models adaptable to logistical and tactical support techniques are being groomed for a thorough evaluation shakedown during the two week maneuver. Planes from Military Air Transport Service will be used in heavy troop and cargo movement phases of the exercise and will also be on competitive status.

Plan envisions actual establishment of an airhead by some 35,000 combat equipped troops. All troops will be flown into the airhead and every pound of equipment and food for troop existence and maintenance in battle will be air transported. Major Army units engaged in the exercise will be the 82nd and 11th Airborne Divisions plus about 100 other Army units from all parts of the nation. Air Force will employ an additional 5000 officers and men in the maneuver.

Direct Flying Costs of AF Planes

Direct flying cost of the Convair B-36 intercontinental bomber per hour is $1024.17 according to USAF sources. The cost figure includes supplies, equipment, gas, oil and lubes, but does not reckon in labor costs.

Next most expensive operational combat plane in the USAF hangar, the Boeing B-50 bomber costs $421 an hour on the same basis, as compared to $386.77 for the four-jet North American B-45 light bomber, $233.32 for the Boeing B-29, and $96.97 for the B-17.

Newest and fastest jet fighter in operational status, the North American F-86 Sabre, costs $145.11 an hour as compared to hourly flight costs of $120.18 for the Lockheed F-80 Shooting Star, and $117 for the Republic F-84 Thunderjet fighters. Indication of the step-up in operational costs of the jet fighters over the older piston-engine fighters is seen in hourly costs of $68.95 quoted for the Republic F-47 Thunderbolt and $62.92 for the North American F-51 Mustang, and $96.49 for the North American F-82 Twin Mustang.

Highest military transport hourly flight cost shown is $272.40 for the Boeing C-97 Stratofreighter. Douglas C-74 cargo plane flight cost per hour is $237.45. Other transport flight hour costs include: Douglas C-54, $97.71, Fairchild C-82, $79.27, Curtiss C-46, $57.50, Douglas C-47, $37.63, Beech C-45, $18.61.

Other direct flying cost per hour figures include: Sikorsky H-5 helicopter, $40.54, Convair L-5 liaison plane, $8.48, and North American T-6 Trainer, $13.84.

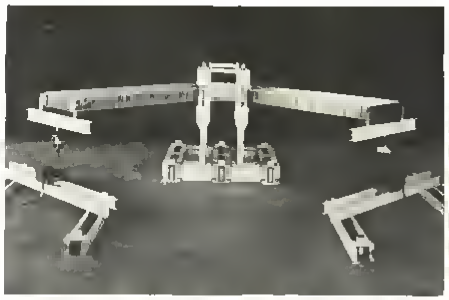
Crash May Upset B-25J Trainer Plan

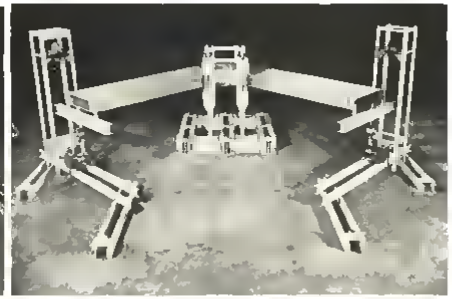
Jack Steppe, assistant to chief technical engineer and six other North American Aviation employes lost their lives in the crash of the company's twin-engine B-25J trainer modification demonstrator (AVIATION WEEK March 27) as it returned to Los Angeles after a Washington demonstration. Plane was reported attempting an emergency landing on a highway in a violent wind storm near Mesa, Ariz.

Others in the plane were: E. A. (Tony) O'Brien, project engineer on the B-25J modification; Miles Towner, pilot; Dominic Kuchan, crew chief; Robert W. Foy, public relations; James Schaeffer, technical representative, and Tyrus J. Kehmeier, technical representative at Patuxent Naval Air Station.

Steppe served as a North American project engineer on the P-51 Mustang, later as vice-president engineering of Globe Aircraft Corp., original builder of the Swift personal plane, and later as vice-president engineering of Culver Aircraft Corp., at Wichita. He returned to North American after Culver Corp. went into liquidation.

Effect of the demonstrator crash on North American's proposal to USAF to modify similarly many of the 1400 B-25Js remaining in USAF storage in usable condition had not yet been determined last week, pending further investigation of the accident.





Bending test setup (left) of 45-deg sweptback box beam. Specimen is being subjected to symmetrical tip bending load—cable and dynamometer apparatus is pulling down on each end of beam (and on both sides of each end) with equal force. For symmetrical tip twisting load (right) apparatus is twisting both ends inward by pulling down on outboard corners in foreground, up on corners in background. Specimen has 30 in. chord and carry-through section. Length of outboard parts of beam is about 90 in.

Sweepback Effect on Box Beam Stresses

Tests at NACA disclose major consequences only on inboard portion. Accurate theory developed.

The aerodynamic advantages of wing sweep are well known but sweeping the wing back presents structural problems that are growing more acute as speeds increase and wings grow progressively thinner and more flexible.

Sweep back results in an increase in local lift coefficient and loading coefficient outboard so that the tips of swept wings are more heavily loaded than those of straight wings.[1]

Coupled with this phenomenon is the ever-decreasing thickness of high speed aircraft wings, with resulting lowering of stiffness and consequent susceptibility to aeroelastic difficulties.[2]

An additional vital problem is created by the fact that the aerodynamic loading of swept wings is greatly affected by the structural deformation caused by the loading.

▶Components Analyzed—Simultaneous consideration of all of these effects results in design problems of tremendous magnitude, whose solution requires extremely complex mathematics and the assistance of special electronic computing machines.

For this reason, the problem to date has been attacked by breaking it down into its component parts, each of which is solved on the basis of simplifying assumptions.

An example of this approach is the measurement of stress and distortion in a 45 deg. swept box beam subjected to bending and to torsion reported by Zender and Libove.[3]

▶Beam Makeup—As an initial approach to the problem, a simple box beam without taper was subjected to symmetrical bending and twisting loads and its stresses and distortions measured. The beam was built up on two steel spars, with 0.078-in. webs and 1½ × 1½ × ⅛ in. flanges, and 0.050 in. 24S-T aluminum alloy skin.

The skin was stiffened by ¾ × ¾ × ⅛ in. external stringers parallel to the spars and spaced 2 in. apart, or 13 between the spars. A center section 30 in. wide, simulating a fuselage, used similar construction, the outer panel and center section spars and stringers being spliced to form a homogeneous structure.

▶Load Application—The bending load was applied by a hand-operated winch winding a cable attached to an I-beam and then to the tip bulkheads to insure symmetrical loading.

The twisting load symmetry was obtained by an "up" load on the outboard end of the tip bulkhead, the center of which was secured through a cable to the center winch.

Tip bending load applied was 2.5 kips, the twisting load was 43.42 kip-inches. Strain gages were used to measure strains and the deflections were measured by dial gages.

▶Analysis—Results of the bending tests show that the main effect of sweepback on the stresses due to bending loads is to produce a concentration of normal stress and vertical shear in the rear spar at the cross-section immediately outboard of the carry-through bay, whereas the normal stress and vertical shear in the front spar at this cross section are relieved.

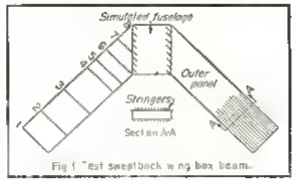


Fig 1. Test sweptback wing box beam.

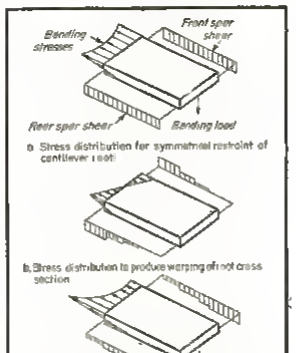


Fig 2. Qualitative stress distribution of swept panel obtained by superposition.

Stresses in the outer portion of the box beam tested, extending from the tip to a cross section approximately one chord length from the last complete inboard cross section, were given with reasonable accuracy by elementary formulas for bending of beams.

Normal stresses in the stringers and flanges in the outer portion of the beam are fairly close to those given by the formula Mc/I (in which M is bending moment in kip-inches, c is distance in inches from neutral axis to any fiber and I is the moment of inertia in inches to the fourth power).

The skin and spar shear stresses in the outer portion of the beam are fairly close to those given by the formula VQ/It (where V is shear force in kips, Q is static moment in inches cubed, and t is thickness in inches).

However, the normal stress in the rear spar near the root was 1.40 times Mc/I and the vertical shear stress was 1.33 times the vertical shear stress at the tip, indicating a substantial "loading up" of the rear spar and a correspondng relief of stress in the front spar.

▶Section Warp—This loading up of the rear spar is a consequence of the geometry of the sweptback wing problem. Inspection of Fig. 1 shows that bulkheads 6 and 8 form a triangular bay. As a result, more restraint is offered to the rear spar at bulkhead 6 than to the front spar.

Hence, the front spar rotates more in its own plane at bulkhead 6 than does the rear spar. The result is a warping of the cross section at 6.

Fig. 2a illustrates the stress distribution in the box outboard of bulkhead 6, assuming symmetrical elastic restraint.

Fig. 2b shows a self-equilibrating antisymmetrical stress distribution applied to the box outboard of bulkhead 6 simulating the warping of the cross section previously mentioned.

By the principle of superposition, the stress distribution of that portion of the box beam outboard of bulkhead 6 can be obtained by superimposing the distributions of Fig. 2a and 2b, resulting in the distribution shown in Fig. 2c, which agrees closely with the results obtained.

▶Bay Changed—The shear-lag portion of the stress distribution shown in Fig. 2a can be obtained by conventional shear-lag calculations, using the method of Reference 4. The triangular bay is replaced by a rectangular bay clamped at its inboard end with a length equal to 15 percent of the length of the front spar of the triangular bay, and a shear-lag calculation is made for the resulting cantilever box beam.

The torsion bending part of the stress distribution can be obtained by applying the principle that the warping of the cross-section at bulkhead 6 due to the stresses shown in Figs. 2a and 2b, when the cross section is considered part of the inner portion made up of the triangular and carry-through bays, must be the same as the warping when the cross section is considered part of the cantilever outer portion.

▶Twist Test Data—Results of the twisting tests show that the skin and spar shear stresses due to tip twisting moments are substantially the same as those given by the elementary formula $T/2At$ (in which T is torque in kip-inches, A is area enclosed by the cross-section in square inches, and t is thickness in inches) in the outer portion of the beam extending from the tip to a cross-section about one chord length from bulkhead 6.

From this cross-section inboard to bulkhead 6 the skin and spar shears change slightly from their elementary values as a result of the restraint against cross-sectional warping provided by the triangular bay.

This restraint against warping produces stringer stresses about half the magnitude of the shear stress $T/2At$ at bulkhead 6. From bulkhead 6 towards bulkhead 8 in the triangular bay both the skin and spar shears show a marked decrease.

Calculations show that, for the purpose of estimating the skin and spar shears and the bending stresses due to torsion just outboard of bulkhead 6, the triangular bay may be replaced by a rectangular bay of half the length clamped at its inboard end.

The resulting structure is an ordinary cantilever box beam and the theory and formula of Reference 5 may be applied.

▶Spar Deflections—The estimated spar deflections were computed by assuming the beam to be clamped as a cantilever at bulkhead 6 and superimposing on the cantilever deflections the deflections due to the flexibility of the inner portion of the beam. Computed results together with actual test points are depicted in Fig. 3a, which shows the validity of these assumptions.

The measured and computed spar deflections were used to calculate the rotations of cross-sections perpendicular to the spars and cross-sections parallel to the direction of flight, Fig. 3b.

Here the agreement is not so good and is explained by the presence of an indeterminate amount of bending in bulkhead 6 in its own plane as well as the rate of twist caused by the warping of the cross-section at bulkhead 6.

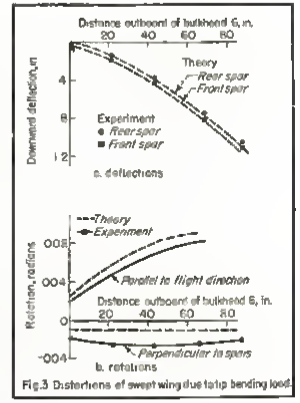


Fig. 3 Distortions of swept wing due to tip bending load.

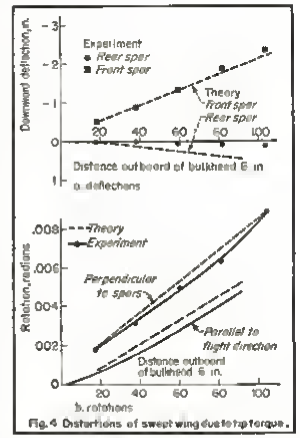


Fig. 4 Distortions of swept wing due to tip torque.

▶Torsion—Fig. 4a shows the distortion due to torsion. The computed curve is obtained by applying ordinary torsion theory formula $d\phi/dx = T/GJ$ (in which ϕ is rotation of cross-section in radians, x is distance from origin in inches, T is torque in kip-inches, G is shear modulus of elasticity (4000 ksi) and J is torsional stiffness constant in inches to the fourth power) to the outer portion of the beam and then superimposing rigid-body translations and rotations due to the flexibility of the inner portion of the beam.

The measured and computed spar deflections shown in Fig. 4a were used to calculate the cross-sectional rotations shown in Fig. 4b.

It is apparent from the foregoing that those portions of swept wings lying

outboard of a plane about one chord length from the most inboard full chord obey conventional beam, shell and torsion formulas and that the only new problems posed by wing sweep arise from the creation of triangular bays between the wing root and the inboard full chord.

However, methods are available for making reasonably accurate calculations of the effects of such bays on the bending and torsion stresses and deflections for the wing as a whole.

References

1. Van Dorn, Nicholas H. and DeYoung, John: A Comparison of Three Theoretical Methods of Calculating Span Load Distribution on Swept Wings. NACA TN 1476, Nov., 1947.
2. Diederich, Franklin W.: Calculation of the Aeroelastic Loading of Flexible Wings of Arbitrary Planform and Stiffness. NACA TN 1876, April, 1949.
3. Zender, George and Libove, Charles: Stress and Distortion Measurements in a 45 Deg. Swept Box Beam Subjected to Bending and to Torsion. NACA TN 1535, March, 1948.
4. Kuhn, Paul: A Recurrence Formula for Shear-Lag Problems. NACA TN 735, 1939.
5. Kuhn, Paul: A Method of Calculating Bending Stresses Due to Torsion. NACA ARR, Dec., 1942.

Clutch For Tunnel

An order for the development and manufacture of a 180 hp fluid magnetic clutch has been placed with Duncan & Bayley, Inc., Buffalo, N. Y., by NACA.

Believed to be the largest mechanism of its kind, the 5100 lb.-ft. torque device will be used by NACA as a means of control for model studies in a new supersonic wind tunnel project.

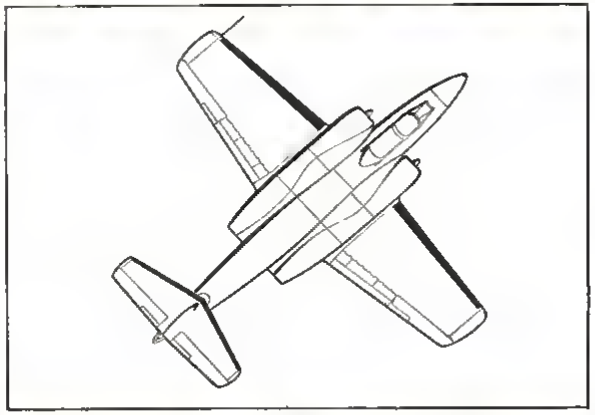
Duncan & Bayley lays claim to being the first to produce commercial configurations of the magnetic fluid clutch for servo applications.

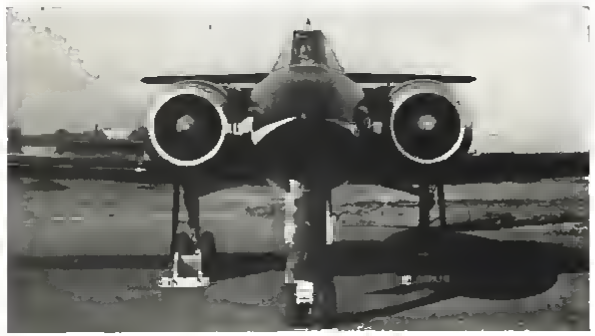
These units, known as proportional torque controllers, use the principle of solidifying a mixture of fine iron particles suspended in a lubricant, by means of a magnetic flux. The principle was disclosed several years ago by Jacob Rabinow of the National Bureau of Standards.

Caster Savings

Standardization on eight types of casters for plant equipment has brought initial savings of $25,000 and resulted in improved procurement practices at Lockheed Aircraft Corp., Burbank, Calif.

To facilitate its standardization program, Lockheed purchased Aerol Caster Corp. Casters produced by the subsidiary firm, to keep on wheels Lockheed's 8000 movable workstands and equipment carts, are lightweight rugged units, all fitted with rubber tires impervious to oil and other inimical matter.





Canada's Long-Range Fighter

New views of A. V. Roe Canada Ltd.'s CF-100, which recently made official flight at Ottawa, show details of this long-range, all-weather fighter. Rolls-Royce Avons are over-wing mounted in nacelles connected to fuselage by unusually thick sections reaching from wing bottom almost to top of nacelles and extending well forward of leading edge. Craft's span is 52 ft., length is 52½ ft. Height to top of canopy is 10 ft. 7 in. and to top of tail, 15 ft. 1 in. The stabilizer, 21 ft. long, is mounted high on fin. Cockpit is equipped with two tandem Martin Baker ejection seats. Plans are to fly craft to England for the next SBAC exhibition scheduled for September.

Engineers View Flight Propulsion Future

Advantages of various powerplant systems weighed; propeller, icing, rocket burning factors examined.

Representatives of a wide segment of the aviation industry assembled at the Fifth Annual Flight Propulsion Meeting of the Institute of the Aeronautical Sciences, in Cleveland, Ohio, to give the latest thinking in their respective fields. Technicians brought together included engine experts, propeller engineers, aerodynamicists, a nuclear energy engineer, aircraft designers, air line engineers, NACA researchers.

Here are summaries of papers presented at this Mar. 24 meeting:

Do We Need Turboprops?—E. V. Farrar, executive engineer, and R. E. Johnson, field engineer, Wright Aeronautical Corp.

Fundamental considerations involved in selection of an aircraft powerplant are no different today than 20 years ago. However, the problem is greatly complicated by the number of different types likely to be available in the near future. To determine the need for turboprops, factors of cost of engine operation and airplane speed and range with reciprocating engines, turboprops or turbojets are examined.

The analysis indicates that a turboprop powered transport in the 350- to 550 mph. cruising speed range will exhibit lower cost per ton mile than a plane powered by reciprocating engines or turbojets. The turboprop powered craft with a given payload will fly about 100 mph. faster than one powered by reciprocating engines, for the same operating cost per mile.

Design Refinements in Modern Propellers—Thomas B. Rhines, chief development engineer, Hamilton Standard division, United Aircraft Corp.

The general process of design refinement as applied to aircraft propellers is discussed in relation to fundamentals of propeller aerodynamics that establish the ultimate goals toward which progress is desired.

Examples of design refinement activity are presented in particular connection with the problems encountered in achievement of good aerodynamic performance at high airplane speeds. Current wind tunnel test results in this field are summarized and related to the probable ultimate performance that can be expected for high speed flight.

The Optimum Performance of Short-range Rocket Powered Missiles—Allen E. Puckett, head, Missile Aerodynamics Section, and R. H. Edwards, Hughes Aircraft Co.

Performance of a rocket-powered missile is investigated under conditions where gravity and lift have small influence on this factor. Dependence of required propellant on range, average flight speed, and burning time or burning program, including the effect of drag, is calculated approximately.

It is found that an optimum burning program exists, and that even for a constant burning rate, under certain conditions there will be an optimum burning time.

Atomic Energy for Aircraft—A. Kaltinsky, chief engineer, NEPA division, Fairchild Engine and Airplane Corp.

The high concentration of energy available in atomic fuels, and their high cost and relative scarcity mark them for uses where there is a high premium on performance rather than on direct cost per unit of power produced. Propulsion of aircraft is one of the possible applications which meets these requirements. Since the performance of an atomic-powered plane would not be affected by range requirements, very high performance in terms of speed and altitude could be combined with a high payload and a practically unlimited range.

Principal obstacles in the design of an atomic aircraft engine are the development of shielding against the lethal nuclear radiations, within the weight limits imposed by aircraft use; adequate cans to retain radioactive fission products; a reactor capable of operating at high temperatures, power densities and thermal stresses, and a safe flexible control system.

Looking Ahead with Air Transport—Charles Froesch, chief engineer, Eastern Air Lines, Inc.

This paper briefly outlines the present status of the air transport industry and, looking ahead, the author proceeds to determine what speed can be justified economically and best serve the public interest. Also, how large can we afford to build air transports to meet frequencies of schedule requirements and yet earn a profit, and how can the newer jet propulsion developments be best used at the greater speeds than were possible heretofore.

Tentative specifications for a medium range and local schedule operation aircraft are discussed. Advantages of the helicopter versus the airplane for local schedule operation are presented. Air cargo transport specifications are also discussed.

Some design and operational requirements of high speed transport aircraft are presented to stimulate the designer's ingenuity and guide his thinking.

Propulsion Analysis for Long Range Transport Airplanes—A. Kartveli, vice-president and chief engineer, Republic Aviation Corp.

In analyzing the performance of modern air transport airplanes with various types of propulsion schemes, the problem is found to be too complex and dependent upon many other variables to permit valid conclusions to be drawn from an overall generalized study.

The problem, therefore, has been restated in terms of determining the effect of various propulsion systems on the range vs. speed performance of an optimum size transport airplane designed for transoceanic or transcontinental operation with a payload of 10,000 lb. Since fuel load is also a major variable in any such analysis, this quantity has been kept constant, with the assumption, in each case, that the wing is chosen of just sufficient size to house the same fuel volume.

Reciprocating engine, turboprop, and turbojet propulsion systems have been studied at altitudes from 20,000 to 40,000 ft., and curves of the relative range characteristics are presented.

Turbine Powered Transport Development—R. D. Kelly, superintendent of technical development and F. F. Davis, engineering and maintenance assistant to vice president, operations, United Air Lines, Inc.

The British aircraft industry has demonstrated to the air transport operators that the turbine powerplant has many qualities which make its application to commercial transport very attractive. The demonstrated reduction in cabin noise and the almost complete absence of engine vibration are the most important improvements made to passenger comfort in many years.

The great increase in speed because of the greater power and reduced drag of the turbine powerplants is considered most inviting.

The present problem of the commercial transport operator is to evaluate the practical day-to-day operating characteristics of these new aircraft to determine if they are economical, safe and have the ability to be integrated into our present extensive commercial operations.

This is the approach the authors have attempted in this paper. They believe the problems are formidable but are sure that the turbine engine eventually will replace reciprocating powerplants in all high speed airline equipment.

Propeller Turbines in Transport Aircraft—W C Keller, project engineer, Consolidated Vultee Aircraft Corp

Convair's history with propeller-turbine powered aircraft includes the world's first flight with such engines in the XP 81 in 1945, using a General Electric TG-100

Possibilities of subsequent engineering developments were such that Allison T-40 turbines were chosen to power Convair's new Navy patrol flying boat, the P5Y, scheduled for flight early this year Increased performance expected through use of these engines should yield tremendous impetus to the design of water-borne military aircraft

With demands for improved economic and aerodynamic performance in commercial transport aircraft, Convair instigated a study of turbine powered airframe design relative to airline economics It has concluded that adaptation of propeller-turbines to existing modern airframe designs is the next most logical step

Study in this direction evolved the combination of the Allison Model 501 engine and the 240 airplane, expected to give increased performance of substantial value to both the military and commercial versions of this craft

Operational economics of the propeller turbine 240 are held quite promising and deemed of considerable interest to the airlines

The Meteorology and Physics of Icing—Paul T. Hacker and Robert G. Dorsch, NACA Lewis Flight Propulsion Research Laboratory

Meteorological and physical factors conducive to aircraft icing are summarized, with emphasis on supercooled water.

Data on the liquid water content, droplet size, and temperature of icing clouds are presented and the variations in these icing parameters with cloud type and altitude are discussed Supercooled water phenomena are considered and illustrated by a short film

Determination of Heat Requirements—Thomas F Golder and James P Lewis, NACA Lewis Flight Propulsion Research Laboratory

Heating requirements for adequate thermal icing protection of a turbojet aircraft are presented The limiting ambient air temperature, flight speed, and altitude at which ice forms on the critical components are determined The experimentally and analytically determined values of the factors involved in the wet air analysis, used in determining the external heat requirements, are discussed

An evaluation of the external heating requirements in terms of the meteorological icing condition flight speed, altitude, and attitude is made and the conditions at which the maximum heating requirements occur are indicated

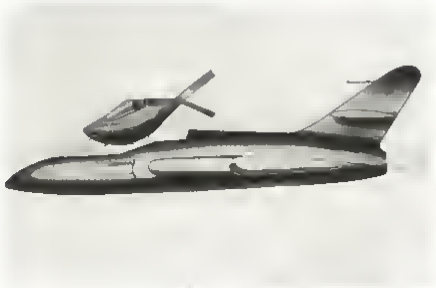
A comparison of the external heating requirement for several methods of protection is made, and the resultant large values for turbojet aircraft indicate the severity of the problem of obtaining adequate protection and the necessity for an efficient design

Thermal Anti-Icing Systems for High-Speed Aircraft—Harrison C Chandler, Jr, and Stanley L Koutz, NACA Lewis Flight Propulsion Research Laboratory

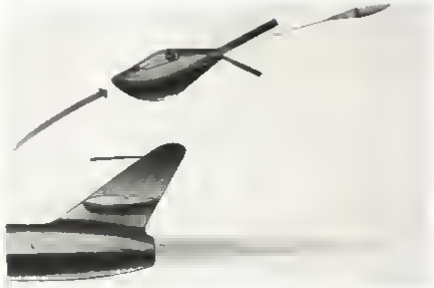
A comparative analysis is made of thermal anti-icing systems suitable for high-speed planes, with particular application to the turbojet transport The analysis covers various methods of ice protection for both the airframe and the propulsion system.

The thermal anti-icing systems considered are examined on the basis of their relative efficiencies, weight utility, and effect on airplane performance The analysis includes discussion of sources of heat on aircraft, which may be employed in conjunction with the thermal systems

Overall objective of analysis is to facilitate the selection and design of optimum thermal anti-icing systems, that is, those which provide adequate protection for high-speed aircraft against icing, with minimum penalty on airplane performance, safety, and dependability



COCKPIT CAPSULE is ejected and fins extend. Then . . .



DROGUE CHUTE is fired clear by "gun." Tension causes . . .

CHUTE DOOR to open, permitting . . .

QUICK RELEASE of second chute. After extension . . .

MAIN CHUTE opens fully, so that . . .

POD ALIGHTS easily on water. Pilot releases chute, lowers battery for stability

Navy's New Exit Cabin

Preliminary tests of a breakaway cockpit unit have indicated that the arrangement is entirely practical, according to the Navy.

Developed by the Navy Bureau of Aeronautics after two years of research, the device is slated for flight check at the Naval Ordnance Test Station, Inyokern, Calif.

Designed to serve as a parachute-borne, emergency-escape vehicle for pilots of high flying supersonic aircraft, the pod-shaped ejection cockpit capsule is pressurized and insulated to insure protection against rarefied atmosphere and extreme cold.

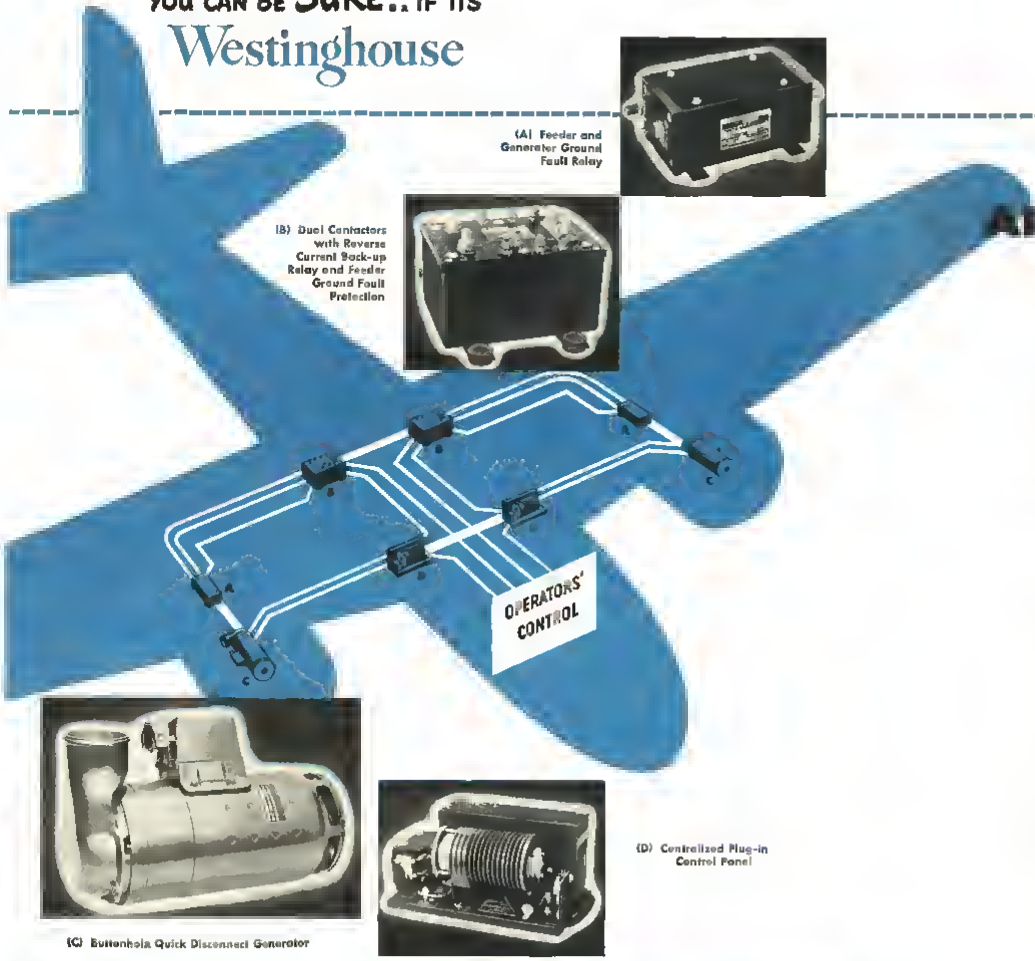
For release, the pilot pulls a lever and the escape capsule is blown clear of the plane.

Tumbling is prevented by 3 stabilizing tail fins, and a large parachute gives easy descent.

The capsule will float if it alights on water and in the event of a crash landing at sea can be unhooked to float clear of the craft proper.

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



(A) Feeder and Generator Ground Fault Relay

(B) Dual Contactors with Reverse Current Back-up Relay and Feeder Ground Fault Protection

(C) Buttonhole Quick Disconnect Generator

(D) Centralized Plug-in Control Panel

AIRCRAFT D-C ELECTRICAL SYSTEMS

"packaged" for four-way savings

Westinghouse placed in service the first "packaged" and protected co-ordinated Electrical Power Systems for aircraft early in 1946. Its many new and convenient features have now been thoroughly service-proved in hundreds of commercial and military installations. Continuously developed improvements provide the system of the future

The D-C system diagrammed here is typical of those operating on aircraft such as the Martin 202, the Lockheed P2V, the North American AJ1, the Northrop C-125, the Aero Sud-Est SE-2010 and the Brequet 763. J-03000

The economic advantages of these "Packaged" Power Systems are fourfold . . .

1. Quick and Easy Maintenance

Centralized plug in type control panel permits all maintenance of controls to be performed at shop bench. Engine run-up operation is no longer necessary for accurate paralleling of generators. Generators equipped with the Westinghouse buttonhole flange may be removed and replaced in ¼th the time required with the conventional mounting flange.

2. Long-Life Parts

"Packaged" components have been carefully co-ordinated and contacts are of liberal size to give extra service life. Records show that the new voltage regulator has greatly extended life over other types and replacement parts cost less. The generator overhaul time can be co-ordinated with the engine overhaul time.

3. System-Wide Power Protection

Instantaneous fault isolation results in far less risk of damage to generator, control devices, cables and structures during the existence of the fault.

4. Unit Responsibility

Not an assembly of individual parts but an integrated "package" designed and produced by one manufacturer with undivided responsibility for the service and performance of every component

DESIGN FEATURES

1. System functions co-ordinated.
2. Accurate control selectivity eliminates hazards of over-excited generators in overvoltage and overload conditions
3. Ground fault protection with current balance or shunts
4. Concentrated bus.
5. Back-up bus protection
6. Centralized control panel. Shock-mounted.
7. Arc interruption by dual contactor.
8. Electrical and manual trip-free operation.
9. Field relay automatically trips with reversed generator polarity
10. Lightest weight for comparable performance
11. Generator overtemperature indication. (Optional)
12. Dead bus system operation

For complete specification data, contact the nearest Westinghouse Sales Office.

Westinghouse

Leader in Aviation Equipment

Proposals for Lightplane Stability

NACA experiments on simple way to center controls, avoiding job of lessening control system friction.

The problem of maintaining a selected heading in a personal aircraft is solved only by constant attention to the controls. This problem is met in multi-engine aircraft by use of the automatic pilot, which permits the pilot leaving the controls for periods as high as an hour. In contrast, planes not equipped with automatic pilots, must be attended closely and the pilot cannot remove his attention from the controls for more than a few seconds.

It is this characteristic of personal aircraft that creates the awkwardness and frustration associated with map reading, performance of simple navigation problems, etc. Inexperienced pilots are often prone to let their attention wander from the job of flying the airplane, and so permit it to slip into dangerous attitudes. Blind flying in personal aircraft not equipped with suitable instruments is also conducive to loss of control through lack of proper references and constant awareness of attitude.

►**Heading Changes**—This difficulty is not a result of any lack of "stick-fixed" stability of current personal aircraft. It occurs only in the "stick free" condition and is, therefore, an uncontrolled motion of the airplane.

The positive stability available in all certificated personal aircraft is adequate to return the aircraft to steady, level flight, provided prompt corrective measures are taken with the controls.

But, upon recovery from such uncontrolled maneuvers the pilot will invariably find that the plane has assumed a different heading, and it is unreasonable to expect any airplane to return to its original compass heading through any inherent stability characteristics.

Important gains, however, can be made in minimizing the amount of this heading change. Two principal factors are involved in this tendency of an uncontrolled airplane to deviate from its heading—spiral stability and trim. These two quantities are separate considerations in the problem and will be detailed accordingly.

►**Spiral Stability**—This characteristic is obtained by the combined effects of the airplane directional stability and its effective dihedral, and is not simply defined. It was recognized early as an important design parameter, and methods for its control developed in the '20s.

Spiral instability is easily recognized in the motion of an airplane following a disturbance. The craft spirals into the direction of the disturbance and gradually steepens this motion until a very tight, very high speed spiral dive results. Danger of the maneuver lies in the difficulty of its detection in an early stage, since the spiral starts gently and usually unnoticeably.

The spirally stable airplane, in contrast yaws into a sideslip and rolls out of the sideslip.

The data presented in Fig. 1 indicate that most present-day personal aircraft possess a slight degree of positive spiral stability for the cruising-flight condition. This is a plot of the directional stability parameter C_{n_β} and the effective-dihedral parameter $-C_{l_\beta}$.

An airplane for which the point on the chart is on the right side of the boundary is spirally stable, whereas one for which the point is on the left side of the boundary is spirally unstable. The cross-hatched region indicates the position in which points for most present-day personal aircraft would be located on the chart.

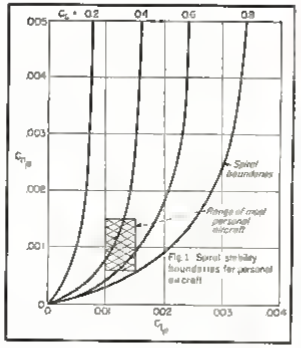


Fig. 1. Spiral stability boundaries for personal aircraft

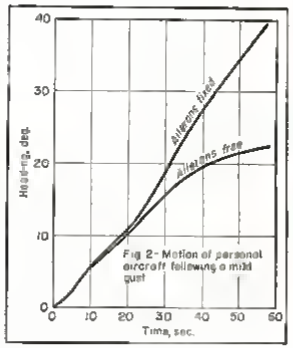


Fig. 2 - Motion of personal aircraft following a mild gust

►**Low Stability Action**—The effect of such low spiral stability is plotted in Fig. 2, which shows the change of heading with time of a typical personal aircraft, following a mild gust disturbance. The airplane banks quickly to 5 deg. and then very slowly regains level flight, having turned through 30 or 40 deg. of heading in the process.

This represents excessively poor performance, and the configuration tested was chosen because it possessed the two salient characteristics required for poor spiral stability—a high degree of directional stability (which causes the airplane to weathercock into the sideslip) and a high cruising lift coefficient (which produces high rolling moments).

Hence, Fig. 2 represents a maximum heading change for present-day personal aircraft, most current types produce heading changes less than these values.

A study by M. O. Kinney, Jr. (Analysis of Means of Improving the Uncontrolled Lateral Motions of Personal Planes, NACA TN 1997, Dec. 1949) indicates that most current personal aircraft exhibit at least an adequate degree of spiral stability, so that they will return to level flight with controls fixed or free, although suffering a large change in heading while doing so.

However, despite this theoretical adequacy of spiral stability, current personal aircraft usually will not return to their original attitude following a disturbance with controls free, hence, the difficulty must be with their trim and not with lack of spiral stability.

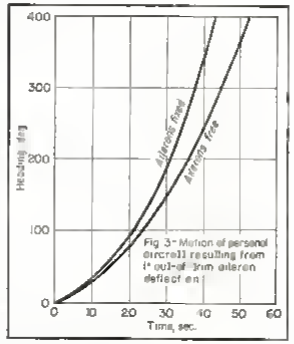


Fig. 3 - Motion of personal aircraft resulting from 1° out-of-trim aileron deflection

►**Trim**—Almost all personal aircraft are out of trim in roll and yaw to a certain extent, because of improper rigging, change of trim with power, absence of

trim tabs or control-system friction, which prevents centering of controls.

As pointed out previously, an airplane has no stability of course. A craft which is out of trim cannot, therefore, reasonably be expected to fly uncontrolled for several seconds without a considerable change in heading.

The profound effect on heading of only a 1 deg. out of trim aileron deflection is shown in Fig. 3. This plot shows that such a deflection can cause the airplane to execute a complete circle in only about 45 sec. and to undergo serious heading change in 10-20 sec.

It is for this reason that trim tabs are highly desirable on all aircraft, small personal types included.

One of the most frequent causes of an out-of-trim condition in a personal aircraft is control system friction. This friction easily can prevent the controls from centering, after deflection by a gust or other disturbance, with the result that 1 deg. of deflection can easily be held in aileron or rudder controls.

▶**Centering Device**—The problem of control system friction is one that has been long debated by personal aircraft manufacturers, chiefly because friction-free controls are expensive to produce.

It is often claimed that moderate friction is desirable, since it tends to hold the controls in neutral after they have been centered there by the pilot.

However, it is the centering problem that is of major concern and the above argument, therefore, is largely academic.

The NACA Langley Laboratory is currently studying the effects of an extremely simple device for automatically centering the controls of aircraft in which the removal of system friction is impossible or excessively expensive.

It consists simply of spring loaded plungers held against the base of the stick. When pressure is removed from the stick, the plungers move it quickly to a position where opposing spring loads are balanced. Such a device is simple to install and inexpensive.

This arrangement produces a non-linear control force gradient through neutral, which might prove annoying to the pilot. It could only be used, of course, on systems in which friction forces are substantially less than control forces, otherwise all control feel would be lost in the process.

▶**Factors Involved**—From the foregoing it is clear that, although control surface friction is the major culprit in the problem of the uncontrolled motion of personal aircraft, its relative importance varies inversely as the positive spiral stability. There are a number of modifications that can be made to present designs that would greatly improve their spiral stability and thereby minimize the importance of control system friction. (Turn to p. 36)

There are three factors that determine the spiral stability of an airplane—dihedral angle, vertical tail size and tail length. It is apparent that these factors also determine a large number of other parameters of the craft, so that a careful choice must be made in the values used.

It is not uncommon in high powered aircraft to permit a slight condition of spiral divergence, since this is easily accommodated by the use of an automatic pilot and by the greater control effectiveness of such aircraft, and because the means for its correction impair more important handling characteristics, such as the rate-of-roll of fighters.

► **Methods Possible**—It has previously been stated that spiral instability can result, in part, from excessive directional stability. This suggests a reduction in vertical tail area as a means of improving spiral stability. But, this change would result in excessive sideslip in aileron rolls.

Analysis of Fig. 1 indicates that the spiral stability of a personal aircraft can be increased by increasing the size of the vertical tail and the dihedral angle simultaneously so as to maintain the same ratio of C_{n_β} to C_{l_β} as that of the original airplane. This change can be made without sacrificing controllability.

Another solution is an increase in tail length simultaneously with a decrease in vertical tail size, model tests indicating no adverse effect on controllability.

► **Research Data**—Tests of a series of progressive modifications to a model of current personal aircraft design incorporating all of these three variables revealed that all the changes for increasing the spiral stability of the airplane improved its uncontrolled motion.

In response to a rolling gust the modified configurations returned to level flight more rapidly and did not change heading as greatly as did the original model. The modified configurations were not as sensitive to out-of-trim conditions as the original model.

Increasing the dihedral angle alone is the least effective method of improving the uncontrolled motions of a personal aircraft, since the motions resulting from an out-of-trim rudder deflection proved approximately the same with large dihedral as with the original dihedral.

Changing the tail length of current personal aircraft is not practical, because of the increased landing gear length required.

Most practical method of increasing the spiral stability of a personal aircraft to improve its uncontrolled motions appears to be to increase its dihedral angle and vertical tail area simultaneously, so as to keep the ratio of C_{n_β} and C_{l_β} about the same, and to use as great a tail length as is practical.

Nine Bell Helicopter Agricultural Operations in 1949

	% of Operation Related to Agricultural Field	% of Gross Income from Agricultural Operation	Number of Flight Hours	Total Acreage to which Pesticides Applied	Acreage Dusted	Acreage Sprayed
Operator 1	95	95	290	10,900	5200	5700
Operator 2	70*	78*	1248	46,990	14,688	18,627
Operator 3	72	77	297	18,680	13,310	5240
Operator 4	50	41	287	14,932	6124	8408
Operator 5	81	92	422	13,340	9110	4230
Operator 6	10	30	55	3500	1000	2500
Operator 7	80*	85*	587*	28,000	280	27,720
Operator 8	100	100	1047*	30,000	23,000	7000
Operator 9	18	15	36	1150	400	——

Other work completed by above Operators
No of Acres—Fogged 750, Seeded 13,315, Fertilized 2149
No of Flight Hours—Fire Fighting 433, Forest Mapping 613, Frost Control 8
* Estimated
Source: Bell Aircraft Corp

Copters Effective in Insect War

Bell Model 47Ds widely used in agriculture; over 15 million lb. of chemicals were applied in 1949.

Agriculture operations by Bell Aircraft Corp helicopters resulted in application of more than 15 million lb of plant protectants and herbicides in the 1949 growing season, David G Forman, Bell helicopter division manager, has estimated for AVIATION WEEK.

Number of Bell Model 47 helicopters in agricultural use increased from a half dozen used early in 1947 to 83 at the end of 1949 In addition most of the 100,000 flight hours accumulated by Bell-built helicopters in the U S and 14 foreign countries in the three years they have been in operation, have been logged in agricultural assignments

"Greater part of the agricultural work done by Bell helicopters has been in areas where there was keen competition from long established fixed wing operators In order to meet this competition the price of the helicopter service had to be comparable to that of other agricultural aircraft Farmer preference and support in these areas was found generally strong for the helicopter after its attributes of aerial application were demonstrated," Forman said

Besides routine agricultural dusting and spraying jobs, Bell operators also engaged in other aerial projects associated with agricultural or pest control—such as seeding and re seeding, fertilizing, frost control, fogging against insects and forest fire fighting

▶ **More Crops**—Indicative of progress of the helicopter aside from the greatly increased number of acres which were treated last year, was the diversity of crops One operator applied agricultural chemicals to 21 different crops, another to 16 and another 15 A listing of varieties treated by one operator includes Melons, flowers, tomatoes, banana squash, grapes, corn, potatoes, beans, celery, cabbage and cotton dusted, sprayed were wild grapes, celery, wheat, barley and cotton

Chief factors in the helicopter's steady growth in the agricultural field, says Forman, is the effective downblast created by the main rotor, which can be controlled by varying height and speed of flight, the maneuverability, and the ability to takeoff and base in immediate proximity to the scene of operations, and to operate in unfavorable weather

The Bell's 400-pound payload, comparable to some of the lighter planes, is off set by its ability to land right at the scene of the operation for reloading This makes it possible for the helicopter to average as high as 50 minutes operation in every hour

▶ **Downwash Effect**—Rotor downwash makes helicopter application more favorable in the treatment of heavy foliated crops requiring penetration This was demonstrated in the summers of 1948 and 1949, for instance, when Bell helicopters distributed aerosol fog over hundreds of acres of Adirondacks forest to control the blackfly The rotor downblast was ideal for forcing the chemical through the forest canopy to the ground

Maneuverability of the helicopter makes it practical and economical for treatment of small acreages

This maneuverability has permitted the helicopter to ignore unfavorable weather which ordinarily would ground fixed wing aircraft In the Cape Cod area last year, helicopters were able to begin spraying for control of the Gypsy Moth at the scheduled time of 7 00 a m on many days when fog grounded air planes until later in the morning

▶ **More Night Flying**—Last year also saw an increase of about 20 percent in night flying by helicopter, permitting the application of such chemicals as leaf defoliants, which must be used under moist, humid conditions Application at this time when air conditions are highly favorable for deposit of pesticides holds much promise for wide use of the helicopter Considerable night flying was done in Columbia, South America, on banana tree spray projects

Probably the most dramatic use of the helicopter at night, as in frost control Downdraft of the rotor is employed, either to force the stratified layers of warm air groundward, or to circulate the air to prevent frost formation.

Where the warm air layer is found to be 200 to 300 feet above the ground, pilots have devised a flight technique of making two passes to move the air downward The first is made slightly above the 300-foot level, the second at less than 100 feet

▶**Temperature Raised**—In Florida ground instruments showed that the temperature was raised from 32 to 36 degrees Potato and tomato crops received the benefit of these treatments.

Distribution of chemical fertilizer is another phase of agriculture in which the helicopter is proving itself Recently one Bell operator deposited 63½ tons of sodium nitrate in 14 hours of flying, for an average rate of 4½ tons an hour.

The speed with which this job was accomplished, Forman points out, speaks well for the helicopter's ability to operate right out of the field that is being treated if necessary. In this instance, 128 landings for reloading were made by one helicopter in 4 hours and 50 minutes

In addition to those in the U S, 35 Bell helicopters are in operation in South America, Europe and Africa in agriculture In Argentina they have controlled effectively locust swarms which annually caused billions of dollars worth of damage In Sardinia they are being used to combat the malaria bearing mosquito and in Brazil the coffee weevil is the object of attack by the helicopters

According to Forman, cost of helicopter maintenance has been cut sharply Maintenance has been reduced 300 percent on the transmission alone and similar improvements have been made in other working parts Practical application and experimentation also have increased the efficiency of dust, spray and fog equipment, completely new three years ago

Change Operators at Milwaukee Field

Cran Aire, Inc, has taken over management of the Curtiss-Wright Airport at Milwaukee, succeeding Fliteways, Inc, which had been operating the field on a month-to-month basis since Milwaukee County bought it in 1947.

Cran Aire has leased the field for three years, agreeing to pay the county a percentage of gross revenue with a guarantee of $6000 a year plus 2 cents a gal from gasoline sales and 5 cents a gal on oil

▶**Services Offered**—While the field has been open since the finish of construction work last August, it is stated that this will be the first time it has been put into full-scale operation

William J Lotzer is president of Cran Aire. Services will include a complete flight school, aircraft rental, charter plane service, aircraft sales, a CAA approved repair shop and parts service, storage and tie-down facilities, restaurant, gas and oil service, and a radio repair shop

A cable tie-down service is being installed at the field Hangars can handle 45 planes

About $1,250,000 has been spent on the field by the county, including its original cost, enlargement and improvement There are five dual grass landing strips, 2400 to 3100 feet long The county has bought additional land to enlarge the field from 164 acres to 394 acres.

Dust-Spray Advisor

To aid its crop duster and crop sprayer members during the coming season, Washington State Aviation Assn has added a qualified agrologist and chemicals consultant to its staff

Stuart W Turner, MSA., M.A.I C., former agricultural faculty member of the University of British Columbia, Vancouver, B C, will give technical advice on chemicals, applicating procedures, and equipment, and precautionary procedures Calibration of aircraft to meter the amount of chemical flow and organization of classes for operators, pilots and fieldmen also will be part of the new service

AG-14 Two-Placer Progress Reported

Latest progress report on the Anderson, Greenwood AG 14 all metal two-place pusher personal plane reveals that static tests on the craft were completed during February Thirty-one different conditions have been set up and proved, most of them requiring two different loadings Continental has completed type certificate trials on the C-90 engine with approval expected to come through without delay

The first production plane is expected to make its initial flight by June 1, and the Houston, Tex, company states that aerodynamic refinements and close weight control is expected to result in increased performance figures over the prototype Four production models are well along towards completion at the present time

Price is calculated at between $4000-$5000 for the fully equipped deluxe version

BRIEFING FOR DEALERS AND DISTRIBUTORS

▶**Pest Warriors**—Wyoming has collected $1,500,000 to fight the grasshopper menace in 1950 and plans to enlist the aid of aircraft operators to "bait" nearly 2 million acres of rangeland grasses A five man grasshopper board has been formed and will utilize the services of the Wyoming Aeronautics Commission in providing adequate aircraft to be used in the baiting, provide landing facilities, inspect the planes, screen bidders, and help in designing the program

▶**Skylac Appointment**—Babb Co (Canada) Ltd, Montreal, has been named Canadian distributors of Monsanto Chemical Co 's Skylac finishes for plane fabrics Babb will establish dealerships in Toronto, Winnipeg or Edmonton, and Vancouver, and plans to demonstrate a lightplane having a portion freshly recovered with Skylac, a second section rejuvenated with the finish, and a third portion treated with conventional nitrate dope

▶**Airstrip Liability**—An interpretation of liability of a farmer or property owner having a private landing strip for his private use has been given by E. G Funke, deputy attorney general, Sacramento, Calif, in a letter to Warren E Gray, director of aeronautics, Sacramento The views given cover the extent of liability of the property's owner when the facility is used by unauthorized individuals, and indicate that the owner is not obligated to maintain strip in perfect condition at all times

▶**Alternate Weather Stations**—A plan to put weather reports from private airports on official teletype and radio circuits when main terminals in the vicinity are closed in by local conditions has been proposed by Washington State Aviation Assn to the U S Weather Bureau Two private fields in the Seattle area that are often wide open to VFR operations, even when Boeing Field is closed down by fog or industrial smoke, would send in condition reports to the terminal for relay to private flyers

▶**Best Market**—Proof of the common belief that the sparsely-populated western farm and ranch states are the best areas for light plane sales may be found in a new CAA study, "Geographic Aspects of the Civil Aircraft Market," which notes that rural registrations went up an average of 12 percent last year over the previous year, while metropolitan ownership declined about six per cent Report analyzes plane ownership in relation to population, airports, consumer purchasing power, and weather, and can be obtained by writing Civil Aeronautics Administration Office of Aviation Information, Washington

Air Force Bid Information

Air Materiel Command Procurement Division makes available to AVIATION WEEK the latest bid awards, shown on this page. Requests for further information should be addressed to Contracting Officer, AMC, Wright-Patterson AFB, Dayton, Ohio, attention MCPPSX72.

ABSTRACTS

For 6600 flying helmets (50-903):
Lite Manufacturing Co., New York, on a bid of $109,511.40.

For spare parts for C-2 and F-1 Truck tractors (50-786):
Companies sharing: Superior Piston Ring Co., Detroit, on a bid of $7600.36 and Wilkening Manufacturing Co., Philadelphia, on a bid of $3447.60.

For photographic supplies (50-501):
Companies sharing: American Optical Co., Instrument division, Buffalo, on a bid of $21,117.44 and Federal Mfg. & Engr. Corp., Brooklyn, on a bid of $14,400.

For screws (50-825):
Companies sharing: Reed & Prince Mfg. Co., Worcester, Mass., on a bid of $11,613.10 and Stronghold Screw Products Inc., Chicago, on a bid of $1249.

For 1 radio frequency room (50-1107):
Tonney Engineering Inc., Newark, N. J., on a bid of $3439.

For elastic cord (50-980):
Thomas Taylor & Sons Inc., Hudson, Mass., on a bid of $4708.77.

For drawing boards (50-708):
Companies sharing: Roth Office Equipment Co., Dayton, on a bid of $2122.85; Miami Stationers Inc., Dayton, on a bid of $4123; McConnaughey Stationers Inc., Springfield, O., on a bid of $886 and Arthur Brown & Bro., Inc., New York, on a bid of $1170.

For drill press (50-703):
Companies sharing: Boice-Crane Co., Toledo, on a bid of $5080 and Buffalo Forge Co., Buffalo, on a bid of $28,300.70.

For pressure indicators (50-747):
Kollsman Instrument division, of Square D Co., Elmhurst, L. I., N. Y., on a bid of $77,819.69.

For indicators (50-811):
Lewis Engineering Co., Naugatuck, Conn., on a bid of $57,548.55.

For chamber assemblies (50-828):
Companies sharing: Stanhope Products Co., Brookville, O., on a bid of $3340 and Fairchild Camera & Instrument Corp., Jamaica, N. Y., on a bid of $3737.06.

For grinder and honing machine (50-551):
Companies sharing: Heald Machine Co., Worcester, Mass., on a bid of $77,450 and Waterbury Tool div. of Vickers Inc., Waterbury, Conn., on a bid of $85,388.

For 300 fuel nozzles (50-765):
Milwaukee Valve Co., Milwaukee, on a bid of $6250.

For 600 covers (50-860):
U. S. Fibre & Plastics Corp., Stirling, N. J., on a bid of $4220.87.

For summer flying helmets (50-902):
Lite Manufacturing Co., Inc., New York, on a bid of $14,586.42.

For stroboter (50-1000):
General Radio Co., Cambridge, Mass., on a bid of $12,205.30.

For hinges (50-2803):
E. R. Wagner Manufacturing Co., Milwaukee, on a bid of $8025.

For manifolds (50-802):
Stanley Aviation Corp., Buffalo, on a bid of $3282.

For kit, brake, (50-528):
Beech Aircraft Corp., Wichita, on a bid of $125,653.60.

For 243 ammeters (50-842):
Companies sharing: Triplett Electrical Instrument Co., Bluffton, O., on a bid of $171.40; Telectro Industries Corp., Long Island City, N. Y., on a bid of $3758; Marion Electrical Instrument Co., Manchester, N. H., on a bid of $656.50 and Western Electric Co., Inc., New York, on a bid of $1558.70.

For 8600 personnel parachutes, back and seat (50-897):
Switlik Parachute Co., Inc., Trenton, on a bid of $572,000.

For 44,100 humidity indicators (50-807):
Davison Chemical Corp., Baltimore, on a bid of $85,400.

For field maintenance shelters (50-664):
Capitol Awning and Shade Co., Inc., St. Paul, on a bid of $32,487.50.

For 31 field maintenance shelters (50-880):
Capitol Awning and Shade Co., Inc., St. Paul, on a bid of $14,475.

For starters (50-808):
Companies sharing: Jack & Heintz Precision Industries Inc., Cleveland, on a bid of $78,370.58 and Eclipse-Pioneer div., Bendix Aviation Corp., Teterboro, on a bid of $11,481.

For 3 strobodyne tuned assemblies (50-810):
Companies sharing: The Sperry Corp., Sperry Gyroscope Company div., Great Neck, Long Island, N. Y., on a bid of $7000 and Denison Engr. Co., Columbus, on a bid of $4177.

For analyzers (50-838):
Roller-Smith div., Realty & Industrial Corp., Bethlehem, Pa., on a bid of $10,407.45.

For timer assemblies (50-830):
Standard Electric Time Co., Springfield, Mass., on a bid of $4350.

For 180,000 square feet hair bonded rubber (50-880):
Armour & Co., Chicago, on a bid of $8800.

For fecaliscope (50-825):
Bausch & Lomb Optical Co., Rochester, on a bid of $6120.

For multimeters, TS-352/U (50-828):
Utility Electronics Corp., Newark, N. J., on a bid of $26,478.53.

For indicators (50-734):
Kollsman Instrument div., Square D Co., Elmhurst, L. I., New York, on a bid of $78,694.08.

For nuts (50-833):
Companies sharing: Boots Aircraft Nut Corp., Stamford, Conn., on a bid of $194; Aircraft Fitting Co., Cleveland, on a bid of $77; Standard Pressed Steel Co., Jenkintown, Pa., on a bid of $3580 and Elastic Stop Nut Corp. of America, Union, N. J., on a bid of $1598.00.

For reel cases (50-600):
Companies sharing: Dura Steel Products Co., Los Angeles, on a bid of $11,441.44 and A. & Z. Engineering Co., Covington, Ky., on a bid of $4853.06.

For 9300 nipples & valves (50-626):
Companies sharing: Connecticut Telephone & Electric div., Great American Industries Inc., Meriden, Conn., on a bid of $950 and Aro Equipment Equipment Corp., Bryan, O., on a bid of $7398.

For generators (50-746):
Jack & Heintz Precision Industries Inc., Cleveland, on a bid of $20,695.68.

For bolts (50-758):
Companies sharing: Aero Supply Mfg. Co. Inc., Corry, Pa., on a bid of $2310.65; Cooper Precision Products, Los Angeles, on a bid of $10,110.20 and Lamson & Sessions Co., Cleveland, on a bid of $6284.45.

For screws (50-787):
Companies sharing: National Screw & Mfg. Co., Cleveland, on a bid of $2077.65; Sanson & Rowland Inc., Philadelphia, on a bid of $1442.10; Stronghold Screw Products Inc., Chicago, on a bid of $1257.63; Allmetal Screw Products Co., Inc., New York, on a bid of $1032.82 and Anti-Corrosive Metals Products Co., Castleton-on-Hudson, N. Y., on a bid of $886.11.

For electric portable hammers (50-770):
Independent Pneumatic Tool Co., Aurora, Ill., on a bid of $7182.50.

For transmitters (50-798):
United States Gauge div., American Machine and Metals Inc., Sellersville, Pa., on a bid of $123,862.61.

For 8,610,000 pounds dehydrating agent (50-792):
Companies sharing: Davison Chemical Corp., Baltimore, on a bid of $225,600.06 and Filtrol Corp., Los Angeles, on a bid of $244,526.

For manifold pressure gages (50-790):
United States Gauge div., American Machine & Metals, Inc., Sellersville, Pa., on a bid of $5852.61.

For fuel pressure indicators ((50-797):
Eclipse-Pioneer div., Bendix Aviation Corp., Teterboro, on a bid of $8613.80.

For 40 guide worms (50-821):
Nichols Products Co., Moorestown, N. J., on a bid of $6968.

For 40 riveters (50-860):
Chicago Pneumatic Tool Co., Detroit, on a bid of $5000.

For aircraft hardware (50-728):
Companies sharing: Double T Products, Hawthorne, Calif., on a bid of $3496; Aero Supply Mfg. Co. Inc., Corry, Pa., on a bid of $582.05; American Chain & Cable Co., Inc., Automotive & Aircraft div., Detroit, on a bid of $1033, and Harlwell Aviation Supply Co., Los Angeles, on a bid of $614.

For photographic equipment (50-709):
Companies sharing: Camera Equipment Co., New York, on a bid of $385.75; Williams Brown & Earle Inc., Philadelphia, on a bid of $392; Industrial Distributors, Inc., New York, on a bid of $75; American Hard Rubber Co., New York, on a bid of $281.25; Arel Inc., St. Louis, on a bid of $3808 and Carr Corp., Culver City, on a bid of $1229.

For thermometer and calimeters (50-820):
Companies sharing: Arthur S. LaPine & Co., Chicago, on a bid of $32.60 and Hewlett-Packard Co., Palo Alto, Calif., on a bid of $6464.

For aircraft tool stands (50-830):
Greer Hydraulics, Inc., Brooklyn, on a bid of $6363.

For dehydrating agent (50-1000):
The Davison Chemical Corp., Baltimore, on a bid of $27,180.

For mission loading cells (50-852):
Super Electric Products Corp., Jersey City, on a bid of $49,037.83.

For developer assemblies (50-584):
Monument Engineering Co. Inc., Indianapolis, on a bid of $49,938.60.

For 774 electrical resistance bulbs (50-608):
Weston Electrical Instrument Corp., Newark, N. J., on a bid of $8026.38.

For photographic equipment (50-708):
Companies sharing: Philadelphia Manufacturing Co., Philadelphia, on a bid of $1335 and Raygram Corp., New York, on a bid of $1600.

For temperature indicator (50-831):
Lewis Engineering Co., Naugatuck, Conn., on a bid of $31,352.80.

For indicators (50-881):
Eclipse-Pioneer div., Bendix Aviation Corp., Teterboro, on a bid of $34,145.67.

For steel tubing (50-600):
Atlantic Metal Hose Co., Inc., New York, on a bid of $9146.68.

For photographic equipment (50-834):
Companies sharing: Eastman Kodak, Rochester, on a bid of $1166; Sun Ray Photo Co., Inc., New York, on a bid of $8672.60; Ilex Optical Co., Rochester, on a bid of $2482.65; Burke & James Inc., Chicago, on a bid of $697.50; Simmon Brothers, Inc., Long Island City, N. Y., on a bid of $550; Seamless Rubber Co., New Haven, on a bid of $4370.56; George Behm and Sons Co., Dayton, on a bid of $258 and Hunter Manufacturing Co., Cleveland, on a bid of $5988.13.

For electric, gas and oil furnaces (50-400):
Companies sharing: Anderson-Bolds Inc., Cleveland, on a bid of $1590; DuAll Cincinnati Co., Cincinnati, on a bid of $3566.56 and Manhattan Lighting Equipment Co. Inc., New York, on a bid of $3324.50.

For gasoline hose (33 738):
Metal Hose and Tubing, Dover, N J, on a bid of $264 479 75

For bearings (33-843):
Companies sharing Waukesha Motor Co, Wis. on a bid of $2035 06 York Supply Co, Dayton on a bid of $2324 45 and Federal-Mogul Service div Federal Mogul Corp, Coldwater Mich on a bid of $13 282 15

For metal identification tags (33-1040):
Angell Manufacturing Co Dayton on a bid of $7264

For wool aluminum and wool steel (33-861)
Companies sharing Carey Electronic Engineering Co Springfield O, on a bid of $24 600 and Williams Co London O, on a bid of $2502 22

For cases (30-780):
Design Fabricators Inc. Dayton, on a bid of $15 744 23

For 3 rocket power plant (30 062):
Richard E Young Rockville Centre, New York on a bid of $19 950

For line, lead (33 453)
Companies sharing Aerial Machine & Tool Corp. Long Island City N Y on a bid of $85 910 and Industrial Precision Products Co, Chicago on a bid of $12 878 59

For tape (33-823)
Minnesota Mining & Mfg Co St. Paul on a bid of $17 314 70

AF Invitations to Bid

Bid openings are 20 30 days after approximate issue dates shown in the following bid proposals Bid sets containing specifications for items to be procured will be sent to qualified applicants who state bid invitation number

One bid set will be available for examination without obligation by prospective bidders, after bid publication date, at each of the seven AMC procurement field offices This will enable firms to see specifications before writing or telegraphing for their own bid sets

Procurement field office locations Boston Army Base, Boston 10 Mass Government Aircraft Plant No 4, Ft Worth 1, Tex, 39 S LaSalle St Chicago 3, Wright-Patterson AFB, Dayton, Ohio, West Warren and Longo Aves, Detroit 32, 155 W Washington Blvd, Los Angeles, 67 Broad St, N Y 4

INVITATIONS

Meters 1-3 items bid invitation No 50 1203 issue date 20 March delivery within 120 days.

Aircraft generator test stands, 1-4 items bid invitation No 50-1208 issue date 20 March delivery within 165 days

Stand assembly, 1-4 items bid invitation No 50 1209 issue date 20 March delivery 1st article within 45 days balance within 60 days after approval of 1st article

Resistors 1 10 items, bid invitation No 50 1205 issue date 20 March delivery by 1 Aug 1950

Clips 1-34 items bid invitation No 50 1204 issue date 20 March delivery within 90 days

Aircraft bolts, 1-14 items bid invitation No 50 1207 issue date 20 March delivery within 90 days.

Switch 1-2 items bid invitation No 50-1214 issue date 20 March delivery within 120 days

Thermocouple 1 2 items, bid invitation No 50 1211 issue date 20 March delivery complete by Nov 1950

Transmitter 1-10 items bid invitation No 50-1212 issue date 20 March delivery starting July 1951

Aircraft magazines, 1-13 items bid invitation No 50-1221 issue date 20 March, delivery 400 per month starting in June 1950

Control hand printer photographic printing kits 1-5 items bid invitation No 50-1215 issue date 20 March delivery design submitted within 40 days 1st article submitted within 45 days of approval of design balance complete within 60 days after approval of 1st article

Bracket assembly, 7000 each bid invitation No 50-1220 issue date 20 March, delivery 1st Article within 30 days balance within 60 days of approval of 1st article.

Linen thread, nylon and cotton webbing 1 2 items bid invitation No 50-1218 issue date 20 March delivery start within 60 days complete within 60 days thereafter

Container assembly 10 000 each bid invitation No 50 1217 issue date 20 March delivery complete within 120 days

Pneumatic driver, electric wrench, 1-2 items bid invitation No. 50-1223 issue date 20 March delivery within 60 days.

Aircraft hardware 1 78 items bid invitation No 50-1225 issue date 23 March delivery within 90 days after receipt of contract.

Aircraft storage batteries, 1-4 items bid invitation No 50-1228 issue date 23 March delivery complete within 120 days

Filter 9 700 each bid invitation No 50-1227 issue date 23 March delivery starting within 90 days

Filling assembly nipple assembly 1-2 items bid invitation No 50-1210 issue date 23 March delivery 30% within 30 days complete within 120 days

Nuts, 1-13 items bid invitation No 50 1220 issue date 23 March delivery start within 45 days complete within 90 days

Antenna 500 each bid invitation No. 50-123s issue date 24 March, delivery 1st article within 60 days balance at the rate of 75 units per month to begin 60 days after approval of 1st article

Ohmmeter 1-6 items bid invitation No 50-1233 issue date 24 March delivery within 75 days

Plugs, 1-13 items bid invitation No 50-1232, issue date 23 March delivery complete within 90 days.

Indicators, 1 9 items bid invitation No 50-1244 issue date 24 March, delivery complete by Nov 1951

Analyzer radio, 650 each bid invitation 50-5196 issue date 14 March complete delivery in 90 days.

Cell, cap plate, 1-3 items bid invitation No 50-1251 issue date 27 March delivery starting May 1950 complete by July 1950

Tester 1 each bid invitation No 50 1248, issue date 27 March delivery within 120 days

Indicators 1-4 items bid invitation No 50 12a2 issue date 27 March, delivery complete by 1 Aug 1950

Dummy load, 1-5 items bid invitation No 50 1254 issue date 27 March delivery complete within 9 months.

Machine screw 2 each bid invitation No 50-1255 issue date 27 March delivery within 120 days

Road Axe, 750 each bid invitation No 50 1257 issue date 27 March delivery by June 1950

Oxygen servicing trailers 1-4 items bid invitation No 50-1247 issue date 27 March delivery beginning within 90 days.

Gloves 1 17 items bid invitation No. 50-1261 issue date 27 March delivery complete within 120 days

Adhesive tape, 1-3 items bid invitation No 50 1258 issue date 27 March delivery 50% within 30 days, balance within 60 days.

Tester-Torque, 1 2 items, bid invitation No 50 1262 issue date 27 March, delivery within 90 days

Steel plate platform 1 each bid invitation No 50-1259 issue date 27 March, delivery within 30 days

Aircraft bolts 1-101 items bid invitation No. 50-1250 issue date 27 March delivery 50% within 30 days complete within 120 days

Balance assembly 105 each bid invitation No 50 1256 issue date 27 March delivery within 90 days.

Cable assembly; Plug assembly Receptacle assembly 1 8 items bid invitation No 50 1254 issue date 27 March delivery complete within 120 days.

Valve drain, 1-3 items bid invitation No 50 1272, issue date 27 March delivery complete by June 1950

Kit assembly, 1-9 items, bid invitation No 50 1267 issue date 27 March, delivery complete by 1 November 1950

Pack assembly 1 11 items, bid invitation No. 50-1269 issue date 27 March delivery starting within 60 days.

Parachute components, 1-25 items, bid invitation No 50 1253 issue date 27 March delivery start within 30 days complete within 60 days

Sun glasses; tool pouch dummy; ripcord assembly harness assembly, 1-6 items bid invitation No 50 1250 issue date 30 March delivery complete within 100 days

Runway markers cargo cones, 1-3 items bid invitation No 50 1297 issue date 30 March delivery within 90 days

Light assembly 400 each bid invitation No. 50 1289 issue date 30 March delivery within 90 days.

Projector 1 each bid invitation No 50-1280 issue date 30 March, delivery within 75 days

Relay, 1230 each, bid invitation No 50-1282 issue date 30 March delivery within 90 days

Gloves, 1-3 items bid invitation No 50-1281 issue date 30 March delivery within 60 days.

Radio receiver 1-9 items bid invitation No. 50 1274 issue date 30 March delivery complete by Oct. 1950

Cable 35 000 feet, bid invitation No 50-1295 issue date 30 March delivery by Aug 1950

Position indicators, 1-10 items bid invitation No 50 1276 issue date 30 March delivery by Aug. 1951

Antenna assembly 1 2 items, bid invitation No 50-1329 issue date 30 March delivery beginning not later than Aug 1950

Sinclee assembly 1 9 items bid invitation No 50 1303 issue date 31 March delivery within 100 days

Flying jackets, 1 1 items, bid invitation No 50-1291 issue date 31 March delivery starting within 90 days.

Electric exhaust fans 200 each bid invitation No 50-1300 issue date 31 March delivery complete within 120 days

Reflector sections 1-8 items bid invitation No 50-1297 issue date 31 March delivery within 90 days

Position indicators 1-10 items bid invitation No 50-1300 issue date 31 March delivery starting Oct 1950, complete by Oct 1951

Alternator assembly, 1-3 items bid invitation No 50-1210 issue date 31 March delivery complete by Aug 1950

Rectifier, 200 each bid invitation No 50-1294 issue date 31 March, delivery complete within 120 days

Shipping cases 900 each bid invitation No. 50 1302 issue date 31 March, delivery within 60 days.

Tie-downs 1-3 items, bid invitation No 50-1204 issue date 31 March delivery complete by Aug 1950

Bluepoint sling sections 1-8 items bid invitation No 50-1311 issue date 31 March delivery within 60 days

Generator relay, 1 5 items bid invitation No. 50 1950 issue date 31 March delivery starting Sept. 1950

Low pressure valves, 1 3 items bid invitation No 50 1284 issue date 31 March delivery beginning Aug. 1950

Viewing screens 1-6 items bid invitation No 50 1209 issue date 31 March delivery starting 10 July 1950 and complete by 30 Oct. 1950

Radio testing benches, 1200 each, bid invitation No 50-1205 issue date 31 March delivery complete within 120 days.

PRODUCTION BRIEFING

▶ Boeing Airplane Co has completed present Stratocruiser contracts with delivery to BOAC of airline's tenth craft Complete orders of 55 were delivered within 14 months of delivery of first plane to PAA C 97 production is continuing

Valve Aims at Smooth Fluid Flow

Designed to eliminate shock by permitting a gradual pressure increase, without slowing of cycling time.

A new surge damping valve designed to prevent shock in the first place—rather than absorb it when it occurs—in aircraft hydraulic systems has been developed by Denison Engineering Co, Columbus, Ohio

Denison describes the device as an independent unit which is easily adaptable to any hydraulic circuit It can be installed as quickly as a standard fitting and will not interfere with other functions of the circuit

This is claimed to be a big advantage over present methods which involve the costly procedure of building decompression valves and such special controls into hydraulic units to prevent shock in high pressure systems

Other advantages claimed for this valve are that it

- Is lightweight and small
- Does not require manual adjustment or external drain
- Allows free return flow of hydraulic fluid
- Is designed without moving seals which might result in external leakage
- Does not slow down hydraulic cycling time
- Adjusts itself automatically to any working pressure in a fraction of a second Time consumed for operation is no greater than lost motion of shock when no surge damping valve is used

Device normally is closed and opens gradually when pressure is applied to the inlet side—allowing gradually accelerated flow until the valve is fully open After the period of acceleration virtual free flow is maintained as long as fluid continues to flow through the valve When flow is interrupted, the valve quickly resets and is ready for the next operation

Hydraulic surge damping valve is small, lightweight unit, easily installed

An unusual feature reported for this new unit is that it will open at a slower rate of speed when high surge pressures are exerted then when lower surge pressures are applied Also, the rate of flow increases as the pressure at the outlet approaches that at inlet side of valve

Denison points out that "a common method of shock reduction or prevention is to throttle or slow down the rate of shifting 4 way and other valve spools This method requires excess time" and . . . "only a small fraction of this stroke is effective in preventing shock "

Systems using the new valves, the manufacturer says, are adequately protected from shock "with the least possible time consumed for shock prevention," since the valves operate "only at the exact moment shock tends to occur"

To check performance under actual operating conditions, Denison set up a special hydraulic system separated into an "A" and "B" circuit, each incorporating one of the new units The system was cycled 100,000 times with the damping valve in "B" circuit operating to prevent shock and that in "A" circuit bypassed to allow shock

While 17 tubing repairs were required in "A" circuit after this test, none were required in "B" circuit where the valve was operated to prevent shock

Pressure reading taken during tests with an oscilloscope show shock in "A" circuit (Fig 1) as compared to gradual pressure rise in "B" circuit (Fig 2) where damping valve was in operation

When shock occurred in the test system without damping valve protection the hydraulic lines reportedly would jump violently and sting the hands if tubing were held With valve in operation, lines remained stationary and quiet, says the maker

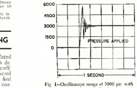


Fig 1—Oscilloscope image at 3000 psi with out surge damping control valve

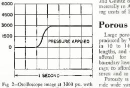


Fig 2—Oscilloscope image at 3000 psi. with surge damping valve operating to cut shock

Lubricating Oil

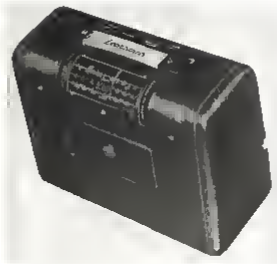
Gulfite oil 5W is light viscosity, all-weather lubricant intended for airplane cabin pressurizing equipment and is claimed to maintain stability in face of severe operating changes Developed by **Gulf Oil Corp.**, product is made of high grade solvent processed paraffinic-type crudes, refined by Alchlor processing Additives are stated to reduce oxidation and increase oil's capacity to sustain high bearing loads

Approval has already been granted and Gulfite oil 5W is being used commercially in AiResearch cabin pressurizing units of EAL's new Constellations

Porous Sheet

Large porous powdered metal sheets produced by Wel Mat Co, Kent, Ohio, in 10 to 14-in widths, 14 to 18-ft lengths, and $\frac{1}{16}$ to $\frac{1}{4}$-in thicknesses, are offered for these applications—wing boundary layer control, wind tunnel linings, to afford positive or negative pressures and in de icing apparatus

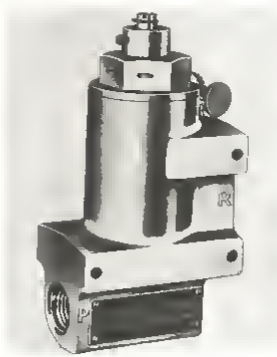
Porosity is closely controlled to provide wide variety of filtering characteristics for air and liquid flow



Portable Radio

Compact lightweight radio receiver adaptable for aircraft use is the Learavian, made by Lear, Inc., 110 Iona Ave. N. W., Grand Rapids 2, Mich.

Incorporated are built-in loop antenna permitting radio direction finding, an external antenna connector for increased range reception, headphone jacks, and dynamic speaker. Three-band reception includes: Marine (2-5.5mc.), standard broadcast (550-1600kc.), and airways (200-400kc.). Unit is available in alligator type luggage case or deluxe mahogany case, and has three-way power operation: 115v. a.c., d.c. or on self-contained dry batteries. Included is battery charging circuit.

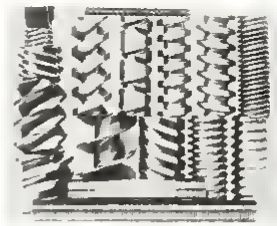


Relief Valve

For very high pressure applications in aircraft hydraulic systems, cartridge type relief valve, offered by **Hydraulic Division of Pantex Mfg. Corp.**, Pawtucket, R. I., is represented to meet or exceed requirements of specifications AN-V-lb.

Permitting pressure settings ranging from 100-5000 psi., unit opens and closes within 7 percent differential. Smaller operating differentials are available if required. Maker asserts constant repeat accuracy is assured by "in balance" design of the valve, and that it is silent and free from squeal and chatter.

Valve design is said to provide high volume flow at all pressures. Device has been tested through temperatures ranging from −65 to 160 F. with no more than 5 percent change in operating characteristics. Internal mechanism is contained in cartridge permitting replacement without breaking line.



Thread Machine

For cutting leadscrews, worms and threads by generating method using a circular cutter, **George Scherr Co., Inc.**, 200 Lafayette St., New York 12, N. Y., introduces Cornelis Thread Generating Machine.

Made in Liege, Belgium, machine is claimed to operate on a principle which "differs considerably from the known methods of milling, lathe cutting or die chasing." Single thread or multiple start threads are cut in a single operation. Since no indexing is required, spacing errors are said to be eliminated.

Thread action is said to be smooth and shape of thread is generated with precision. No special skill is needed to operate machine, which turns out 4 standard lengths: 18, 37, 77 and 116 in., with maximum diameter of 4½ in., 4 D.P., and 30 deg. maximum helix angle. Examples of work turned out by machine are shown.

Rivet Miller

Model A1-429 Micro Miller with 15,000 rpm pneumatic motor is small (five inches overall length), lightweight rivet miller having silenced exhaust which also cool motor and blow chips away from work. Produced by **Aircraft Tools, Inc.**, 2306 E. 38 St., Los Angeles, Calif., device is adjustable in increments of .0005 in. and incorporates these features: adjustable and removable pressure foot frame, footpiece which revolves by hand, replaceable hard shore rubber foot screwed into position, completely enclosed pressure foot to seal lubrication and keep out chips, and matched pair of precision preloaded bearings to support cutter.

Cutters are said to be standard and interchangeable with most types now on the market, no special tools are needed for replacing them, and the unit is capable of being disassembled in less than minute.

Available with cutter and skirt in these sizes: ⅛, 3/16, ¼, 5/16, ⅜, and ½.

Centrifugal Castings

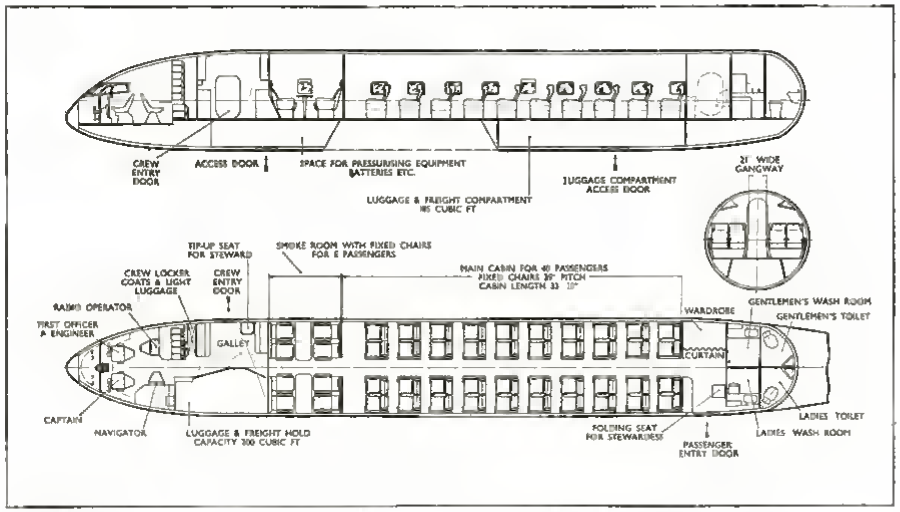
For parts requiring extremely dense and compact structure, centrifugally cast liners, rings, rolls, sleeves and bushings are offered by **American Non-Gran Bronze Co.**, Berwyn, Pa.

Produced in all metals, these castings are blanked to customer specifications to minimize machining and reduce expensive waste of material.

Jet Control Device

For eliminating overtravel in high-speed, remote positioning throttles or jet afterburner valves, **Barber Colman Co.**, Rockford, Ill., offers remote positioning aircraft control device, designed to meet all applicable AN requirements.

Consisting of control cabinet and actuator, mechanism is designed for speeds up to 90 deg./sec. It rapidly approaches desired setting and then hunches to exact position. Models are available for wide range of torque and stroke requirements.



MEDIUM-RANGE turboprop de Havilland Comet will carry 48 passengers Canadian Pacific has ordered this version

Comet Offered for Short Hauls

De Havilland, aiming at wider market, designs 48-seat version and finds a customer in Canadian Pacific.

Determined to give its four-jet Comet transport the broadest possible customer appeal, de Havilland Aircraft Co is touting the plane's medium-range virtues

Canadian Pacific Air Lines, which has two Comets on order, has adopted the 48-passenger interior layout for its run from Canada to Japan and Hong Kong, via the Aleutian Islands British Overseas Airways Corp., on the other hand, is likely to use the original 36-passenger version (AVIATION WEEK Nov. 21) for its longer hops across the North Atlantic.

► **Eliminate Cargo Space**—To help accommodate the extra seats, a freight and baggage compartment in the aft part of the ship has been eliminated, and wash rooms have been moved rearward to occupy the space

De Havilland says the 48-seat arrangement—under study for some time—is now being offered because performance analysis has shown that a 14,000-lb payload can be carried on stage lengths up to about 1750 miles This is only a three-to four-hour flight in the Comet and de Havilland believes there is no need for widely spaced, reclining seats on a trip of that duration.

Recent record breaking trip by the Comet between London and Rome illustrated the medium-range potentialities of the craft It made the 940-mi southbound flight in 2 hr., 6 min., averaging around 450 mph The homeward trip was even faster, taking only 2 hr., 2 min., about 462 mph

De Havilland says the Comet is economical for stage lengths down to less than 1000 miles."

As a long range 36-seater, the Comet is credited with a 12,000-lb. payload-Still air range (with allowances for taxiing, climb, 30 minutes of circling, descent, etc.) is 2645 miles with the 12,000-lb payload But when further allowance is made for a 50 mph headwind and 200 miles diversion to an alternate airport the range at 12,000-lb payload becomes 2140 miles

These loadings to the Comet's 105,000 lb maximum gross weight call for a 2175 yd runway to meet airworthiness requirements, including the ability to take off and land if one engine fails

► **Payload Varies With Headwind**—On the important North Atlantic run the headwind faced by the Comet on the westward crossing is an important factor It varies seasonally and day by day, and the payload varies with it

At present, the Comet can carry an average 8750 lb payload on the Prestwick, Scotland, to Gander, Newfoundland, link (2116 miles), de Havilland reports

In one day out of five during the average year, headwinds would drop the permissible payload below 5800 lb These Prestwick-Gander figures include a 395-mile diversion allowance to Goose Bay, Labrador

De Havilland expects to improve this picture substantially before the Comet starts regular trans-Atlantic operations One development will be a provision for several hundred gallons of additional tankage in the wing This would mean that on only about 18 days of the year would the payload be under 5600 lb

Prevailing favorable winds would keep eastbound payloads considerable higher

► **Flight Refueling Possible**—"The Comet never has been offered as a non-stop London-New York airliner," de Havilland emphasized 'But with the aid of flight refueling, which stands to benefit the Comet more than any other transport, the plane could be operated London-New York nonstop"

Because of its high speed, the Comet can, even with stops at Prestwick and Gander, cut the present timetable times between London and New York from 18 hr to 12 hr westbound and from 12½ hr. to 9 hr eastbound, de Havilland asserts It adds that flight refueling could reduce these times to about 9½ hr westbound and 7½ hr. eastbound,

Turboprop DC-6 vs. the Comet

A comparison between performance of the British de Havilland Comet turbojet transport and that of a hypothetical DC 6 equipped with turboprops has been roughly estimated by a United Aircraft Corp research engineer, on the basis of published data and his own studies Here it is

	Comet	Modified DC-6
Gross weight, lb	105,000	100,000
Payload, lb	6-12,000	16,000
Cruising speed (military power), mph	500	500
Cruising altitude (military power), ft	40,000	40,000
Cruising sfc (military power), mi /lb fuel	.06	.12
Cruising speed (normal rated power), mph	430	430
Cruising altitude (usual rated power), ft	29,000	29,000
Range (still air, military power), mi	3550	up to 40 percent better
Quoted range (normal rated power), mi	2600	up to 50 percent better
Practical range (i.e. 3 hr reserve, 70-mph headwind, normal rated power cruising), mi	1550	up to 50 percent better
Loss in altitude, 1 engine out, ft	10,000	10,000
2 engines out, ft	20,000	20,000
Loss in range, 1 engine out, percent	20	7
2 engines out, percent	40	14

Propeller Planes Still Competitive

Engineer says turboprop DC-6 would match Comet speed and altitude, and still get greater range.

A feeling that Britain's de Havilland Aircraft Co Ltd., builder of the Comet, may be backing the wrong horsepower in advocating turbojets for a transport plane has been voiced by U S propeller men

Sentiment was heard at a recent meeting of the Institute of Aeronautical Sciences, attended by top propeller experts, in favor of development of the turboprop as a better answer to the quest for faster transports

These experts indicated de Havilland had underestimated the ability of the propeller—through refinements—to remain the prime mover for aircraft up to supersonic speeds

With new supersonic props under development, they predicted, turboprop efficiency will be so superior to that of turbojets that a good case can be built for their use with all types of planes designed to fly up to Mach 1 and slightly beyond

An engineer with United Aircraft Corp., East Hartford, Conn., said it was his opinion that development of the Comet, with its fuel greedy turbojets, may prove a serious error if decision is made in this country to convert DC 6 transports to turboprops Essentially all that is required on the DC 6 to overtake the Comet in speed and performance, he implied, is to install four 5500 hp. turboprops with 13½-ft., four-bladed Hamilton Standard propellers

The speaker was Joseph P Grandfield, engineer in United's research department Basing his findings on available published data on the Comet, and his own studies, Grandfield declared that a turboprop powered DC 6 not only would fly as fast and as high as the Comet but would use half as much fuel doing it, have up to 50 percent more range, and carry a greater payload

Turboprop economy, he added, would be comparable to that of the piston engine in the DC-6

He asserted that specific fuel consumption with turboprops would be near that of piston engines now used, while cruising speed would be more than 100 mph faster

With four 5500 hp engines, the turboprop DC 6 would have as much power with two engines out, he asserted, as normally is available when all engines are operating on the DC-6 with piston powerplants

As a dividend, noise and vibration levels would be minimized by the switch to turboprops

Industry Opposes New Rules for Mechanics

Proposed new federal regulations tending to transform aviation mechanics, repair stations and training schools into specialists in particular phases of work have brought a flurry of protests from airlines, manufacturers and fixed-base operators

The contemplated changes purportedly would promote safety by permitting the mechanics, repair stations and schools to function only in the fields where they are particularly well qualified But a number of industry spokesmen don't see it that way.

► **Far-Reaching Effects**—Steps suggested by the Civil Aeronautics Board's Bureau of Safety Regulation will involve far-reaching consequences in the field of labor relations, job evaluation, wage rates and responsibilities, according to some company officials These critics contend that there is no good reason, safety or otherwise, for the revisions in Parts 18, 24 52 and 53 of the Civil Air Regulations

Most important of the proposed changes involves the breaking down of present aircraft and aircraft engine mechanics' ratings into additional categories Under the revision, certificated mechanics could hold separate ratings covering airframes, powerplants, propellers, radio, instruments and accessories.

The instrument rating would be further subdivided into mechanical, electrical and gyroscopic The accessory rating would be split into mechanical and electrical.

► **School Ratings**—Certificated mechanic schools would also be eligible for ratings in one or more of the six general classifications and the sub-classifications under instruments and accessories Each school would be required to establish curricula to fit each of the six ratings for which they are qualified to give instruction

The specialization would go even further for certificated repair stations They could get an airframe rating for

- **Composite construction** up to and including 12,500 lb.
- **Composite construction** above 12,500 lb

- **All-metal construction** up to and including 12,500 lb
- **All-metal construction** above 12,500 lb

Repair station powerplant ratings would cover

- **Engines up to and including 400 hp**
- **Engines over 400 hp**
- **Jet engines**

Propeller repair stations could qualify to work on

- **Fixed-pitch types**
- **Other types,** by make and model

Ratings for instrument and accessory repair stations would be similarly varied. A station could even obtain a limited rating to repair or alter one particular type of airframe, powerplant, radio or instrument. In any case, the station would have to show it was able to furnish the required facilities, equipment, materials and personnel for each rating sought.

Another proposed change would require a manufacturer to secure a repair station certificate with appropriate ratings, and employ certificated mechanics to perform overhaul, maintenance or repair jobs. CAB said it did not believe this would impose a hardship because in most instances the manufacturers already meet the proposed standards.

▶**ATA Objects**—Commenting on the suggested new regulations, Milton W. Arnold, Air Transport Assn. vice president-operations and engineering, said their overall effect would be so serious as to disrupt the present operating procedures of all ATA members.

In 1948, Arnold declared, only two out of 850 aircraft accidents were attributed to personal error by licensed mechanics.

▶**Philosophy Attacked**—The ATA official said the proposed new regulations have not yet been interpreted by CAA but are written in such detail as to be contrary to the desired basic philosophy of writing general objective rules and delegating authority to the airlines.

Under present Civil Air Regulation requirements, an airline sets up a maintenance organization and is responsible for continuous airworthiness of all engines, propellers, accessories and instruments, for maintenance of adequate facilities and for competence of maintenance personnel. "We believe that in complying with this statement of responsibility, whether or not a scheduled airline mechanic has a license is immaterial," Arnold declared.

▶**Added Costs Seen**—ATA believes any proposal which increases rather than decreases the number of specific mechanic ratings required by or available from CAA will have such far reaching effects on labor problems that any estimate of additional cost is unfeasible.

During the past two years ATA's airline mechanics training committee has been working closely with the aeronautical training society to correct existing inadequacies in curricula of aviation technical schools. Through stiffened curriculum requirements, the airlines hope to raise the quality of holders of A&E mechanics licenses. ATA and the Aeronautical Training Society agree that increasing the number of mechanics ratings will not improve the mechanics calibre.

▶**Responsibility Divided**—Maxwell Balfour, Aeronautical Training Society president and chairman of the executive committee of A&E mechanics' schools, pointed out that the increased number of specialists ratings create a potentially dangerous division of responsibility among mechanical personnel. It would be difficult, he observed, to fix blame for faulty workmanship.

▶**AIA Opposition**—The Aircraft Industries Assn. believes that under the proposed new system labor unions would require wage premiums for holders of mechanics' certificates and probably additional differentials for each rating held.

At present, aircraft manufacturers are specifically permitted to perform and approve maintenance and repairs, but this is not the case under the proposed revision. This change, AIA asserts, is an "uncalled for interference with private industry."

The proposed regulations apparently would require certificated mechanics as the top authority for approving or inspecting work done. AIA feels it is "ridiculous" to contend arbitrarily that all (uncertificated) company inspectors are not qualified unless supervised by a certificated mechanic—especially when the company holds a CAA type and production certificate.

Aleutian Cutback Affects NWA Route

Northwest Airlines President Croil Hunter has asserted there will be no interruption in his company's service over the Great Circle route to the Orient despite a Department of Defense decision to close many of its facilities in the Aleutian Islands.

Hunter issued his statement after the Civil Aeronautics Board informed him that expenditure of the substantial amount of federal funds required for continued operation of NWA's Anchorage-Tokyo link "is not justified on economic grounds." The Board advised Hunter to take "appropriate steps" regarding future operations.

▶**Other Lines Affected**—NWA still has hopes that the government will find funds to maintain some of the Aleutian bases in the interest of defense. Northwest now uses Shemya in the western Aleutians as a refueling point. Canadian Pacific Air Lines, which operates a Great Circle Route to the Orient, and Reeve Aleutian Airways, also depend on government operated radio, navigation, weather and landing facilities in the Aleutians.

▶**No Dividend**—The possible effect of this situation on Northwest's future earning power is being watched carefully in the wake of NWA's passing of the dividend due May 1 on its preference shares. This is the first omission of a preferred stock dividend by any major airline.

The dividend payment of May 1 was precluded under the terms of the bank loan agreement covering Northwest's $21 million line of credit, of which $12 million is guaranteed by the Reconstruction Finance Corporation under the loan indenture provisions. The company could pay dividends, in effect, only out of earnings accumulated after April 1, 1949. This "cushion" came to about $2,400,000 as of December 31, 1949. This margin was eliminated when the company lost an estimated $3,250,000 in the first quarter of the year compared with only $1,485,970 for the same period a year ago.

The international division has been contributing the bulk of Northwest's consolidated earnings—in fact, absorbing the domestic division's losses in recent years. The international division is heavily dependent upon mail pay, receiving over 45 percent of its gross revenues from this source.

House Group Cuts Civil Air Funds

Congressional economy ax fell on civil aviation appropriations last week when the House Appropriations Committee trimmed $43 million off the $282 million Civil Aeronautics Administration budget recommended for the 1951 fiscal year and slashed Civil Aeronautics Board's allocation by 23 percent.

The $238,826,500 ($186,415,000 cash and $52,411,500 contract authorization) approved by the committee for CAA compared with the $282,716,500 ($212,555,000 cash and $70,161,500 contract authorization) recommended by the Budget Bureau. Despite the cutback, the committee-approved allocation topped CAA's 1950 fiscal year budget of $207,325,902, its biggest to date, by $31,500,598. Cuts were made down the line. Specific application was left largely discretionary with CAA, but reductions in air safety funds was barred. The committee commented that "there exists a definite requirement to improve personnel utilization."

▶**CAB Down**—The $3,400,000 approved for CAB was $923,000 below the Budget Bureau estimate and $220,500 below the 1950 fiscal year allocation. The Board was severely criticized for failing to bring its work up to date.

Dismissing the Board's contention that it needs a bigger appropriation and more personnel, the committee declared that "the trouble with this agency is not one of appropriations," but "inefficient, outmoded and time consuming methods." The committee added that "there is a lack of centralized administrative control to compel coordination and operating deficiencies and delays, rivalry and lack of cooperation between economic divisions have resulted." It hit at the Board for failing to eliminate clearance-and-review red tape and to adopt effective standards and procedures to expedite cases.

Committee repeated its demand that the airways be put on a self supporting basis. "The federal government cannot indefinitely continue to pay these costs which should be borne to some appreciable extent by the air lines." At hearings, CAA and CAB spokesmen pointed out that levying user taxes on carriers at this time would only boost mail pay subsidies and amount to putting money in one pocket of the government and taking it out of another.

Following is a breakdown of the 1951 fiscal year CAA budget approved by the House committee:

- **Salaries and expenses** $97,000,000—$7,250,000 below the Budget Bureau estimate, but $2,597,895 over the current year allocation.
- **Air navigation facilities** $45,561,000 ($32,000,000 cash and $13,561,500 contract authorization). Approximately half of the allocation is for continuing the "transition" phase of Radio Technical Commission for Aeronautics' all-weather flying program, scheduled to run through 1953. The Budget Bureau recommended $69,961,500 ($40,500,000 cash and $29,461,500 contract authorization).
- **Air navigation development** $8,250,000 ($6,000,000 cash and $2,250,000 contract authorization)—to implement the "ultimate" phase of RTCA's program running through 1959. Budget Bureau recommended $12,885,000 ($9,885,000 cash and $4,000,000 contract authorization).
- **Technical development** $1,375,000, compared with the $1,475,000 recommended by the Budget Bureau.
- **Airport development** $81,700,000 ($45,000,000 cash and $36,700,000 contract authorization). This is a $6,300,000 (in cash) reduction from the $88,000,000 recommended by Budget Bureau.
- **Alaska airports** $3,200,000 for international ports at Fairbanks and Anchorage, the amount recommended by Budget Bureau.
- **Washington National Airport** $1,840,000—a $1,105,000 reduction (for construction of an over-pass from the airport) from the Budget Bureau's $2,945,000. The item should be financed under the federal-aid road program, the committee said. $495,000 for fueling facilities was approved.

CAA Invites Bids on Airway Aids Program

Civil Aeronautics Administration is preparing to spend more money on new electronics equipment for modernization of traffic control, navigation and landing aids which are used on the federal airways.

Acting shortly after it awarded a record $4,210,000 contract for DME (distance measuring equipment) ground stations (AVIATION WEEK Mar. 20), CAA invited bids for furnishing, installing and testing 1 to 40 precision approach radar systems and from 1 to 40 airport surveillance radar systems. Bids are to be opened May 2.

▶**Funds Awaited**—In the past, it has cost CAA roughly $325,000 to install both precision approach and airport surveillance radar at an airport. It is believed unlikely that contracts for the full 40 PARs and ASRs will be let through the present bid invitations since the total outlay appears to be more than CAA will have for the purpose until the fiscal 1951 budget is approved.

Fiscal 1950 budget contained funds for 14 ASRs costing $3,430,000, and 14 PARs costing $3,475,000.

Currently, only three U. S. commercial airports have ASR-PAR facilities operating—Washington National, LaGuardia and Chicago Municipal.

And in each case wartime equipment obtained from the military is being used.

▶**Gilfillan Order**—CAA now has eight ASRs and eight PARs procured under a $1,604,000 contract granted Gilfillan Brothers, Inc., in March, 1948. First of these units has been installed and accepted at Los Angeles, and the LaGuardia installation is close to acceptance. Remaining six Gilfillan ASR-PARs are being established at Chicago, Cleveland, Washington, Atlanta, Boston and Idlewild International Airport.

Meanwhile, CAA is getting 27 ASRs under a $2,966,000 contract awarded General Electric in December, 1948.

Priorities for these units go to airports at Newark, St. Louis, greater Pittsburgh, Seattle, Philadelphia, Houston, San Francisco and Oakland. Some of these may be operating by fall. The entire 27, including others at New Orleans, Indianapolis, Salt Lake City, Portland, Ore., Columbus, O., Covington, Ky. (Cincinnati), Norfolk, San Antonio, Jacksonville, Detroit, Memphis, Dallas, Kansas City, Minneapolis, Denver, Honolulu, Anchorage, Fairbanks and Annette Island, Alaska, should be operating by the fall of 1951.

▶**New Sites Eyed**—Airport surveillance radars for which bids are now being sought would be installed at:

Birmingham, Nashville, Corpus Christi, Louisville, Burbank, Buffalo, Oklahoma City, Baltimore, Knoxville, Dayton, Long Beach, Ft. Worth, Harrisburg, Providence, Charlotte, Montgomery, Ala., Tulsa, Charleston, W. Va., Milwaukee, Austin, Mobile, Spokane, Canton, O., Richmond, Va., Amarillo, Chattanooga, Windsor Locks, Conn., Omaha, Wichita, Toledo, Great Falls, Mont., Syracuse, Ft. Wayne, Greensboro, N. C., Albany, N. Y., Greenville,

TARGET DATE FOR 2-0-2s

Most advanced of 12 Martin 2-0-2s which will be leased to TWA is this plane due to roll off final assembly line June 13. After ground and flight tests, the 36-passenger ship will be delivered to TWA in July. TWA President Ralph Damon (left) points out the target date to Martin President C. C. Pearson, who negotiated the TWA lease as well as the sale of 30 new 40-passenger Model 4-0-4 transports.

S C, Tampa, Wilkes Barre, Little Rock and Augusta, Ga

The 40 precision approach radars would be established at Pittsburgh, Philadelphia, Detroit, Kansas City, Indianapolis, Seattle, Portland, Ore, Houston, Dallas, San Francisco, Newark, N J, Oakland, St Louis, Anchorage, Birmingham, Nashville, New Orleans, Columbus, O, Louisville, Denver, Covington, Burbank, Memphis, Buffalo, Oklahoma City, Baltimore, Knoxville, Dayton, Long Beach, Minneapolis, Ft Worth, Harrisburg, Providence, Charlotte, Jacksonville, Tulsa, San Antonio, Charleston, W Va, Milwaukee and Norfolk

P. O. Deficits

Post Office Department lost $84 million in its airmail operations for the 1949 fiscal year, according to the department's annual cost ascertainment report

This was far less, however, than the $174 million deficit in second class mail operations, the $129 million deficit for third class mail, and the $104 million deficit for fourth class mail The department's total loss for the year on revenue mail operations was $438 million

Post Office's report shows the following deficits on air mail operations during the year

- Domestic loss, $37,261,064 Revenues totaled $65,385,603, expenditures, $102,646,667 The revenue was derived $57,363,830 from letters; $7,785,423 from air parcel post, $147,674 from airmail post cards, and $88,676 from incoming business reply articles
- Foreign loss (exclusive of parcel post), $41,088,571 Revenues totaled $24,088,504, expenditures, $66,077,075
- International Air parcel post loss, $5,734,724 Revenues totaled $1,606,871, expenditures, $7,341,595

SHORTLINES

▶ **Aeronautical Radio, Inc**—The industry sponsored organization is now operating the West Coast radio communications network of United Air Lines and Pan American Airways at Los Angeles, San Francisco and Seattle

▶ **Air France**—Equipment on hand at the beginning of 1950 included 14 Constellations, 28 DC 4s and C 54s, 32 four-engine Languedocs, 46 DC-3s, 11 three engine JU 52s, 3 Catalinas, 3 de Havillands and 8 twin engine Goelands

▶ **Air Line Pilots Assn.**—Reports it has blocked efforts of one carrier to increase the gross weight of its Lockheed Lodestars and of another to boost the gross weight of its cargo DC 3s to 26,900 lb Proposed gross weight increases for the DC-4 and Stratocruisers are also being opposed . The union says that with the recent addition of Flying Tiger Line it now represents pilots on 33 airlines

▶ **American**—Elapsed time on the company's new transcontinental DC 6 coach service, which starts Apr 9, will be 10 hr 5 min eastbound and 11 hr 45 min westbound New schedule will clip 4 hr from its previous DC 4 coach time on the westbound run and 3¼ hr eastbound Both the coach DC-4s and DC-6s can accommodate 70 passengers Telephone reservations for the $110 coast-to-coast coach flights, formerly prohibited by CAB regulations, are now permitted

▶ **American Overseas**—Says March traffic to Europe (spurred by special excursion fares) was "unprecedented" Nearly a third of the U S passengers crossing the Atlantic are taking their first European vacation

BIG BROTHER OF THE DC-6

American Airlines' 11 new DC 6B transports slated for delivery next year, will be virtually indistinguishable from DC-6s from some angles But the above artist's sketch of the new plane points up changes forward of the wing, where the fuselage will be lengthened by five feet The two windows shown forward of the wing in this DC 6B drawing may be missing from the planes finally delivered to American, since the extra space will be used for cargo rather than passengers AA's DC 6Bs will accommodate 52 passengers—the same number as the company's 49 DC 6s

▶ **Avianca**—The Colombian carrier (Pan American Airways affiliate) has inaugurated scheduled service from Barranquilla to Lisbon, Rome and Paris with DC 4s

▶ **Colonial**—Recently took a survey showing that 78 percent of its Bermuda-bound passengers opposed serving alcoholic drinks during flights

▶ **Flying Tiger Line**—Freight revenues in February reached the highest figure in company history—totaling $250,000 In the four months ended Feb 28, the Tigers flew nearly half as much freight as in all 1949 Carrier now serves 18 cities, compared with nine six months ago Interline traffic agreements have been signed with Air France and Trans Canada Air Lines

▶ **National**—Says that if CAB approves the proposed equipment interchange agreement with Pan American and Panagra, NAL revenue passenger mileage will increase as much as 50 percent Company has proposed a fare reduction to intermediate points south of Washington from 6 cents a mile to about 4¾ cents a mile

▶ **Port of New York Authority**—Reports domestic traffic in and out of La Guardia, Idlewild and Newark during the first two months of 1950 was 7 6 percent ahead of last year, with mail and cargo also showing gains International passenger traffic in and out of LaGuardia and Idlewild was up 12 1 per cent over January-February 1949

▶ **TWA**—Probably will first use its leased Martin 2 0 2s on flights operating east of Kansas City

▶ **Trans-Canada**—Planned to start service on its new Montreal Toronto Tampa/St Petersburg Nassau, Bahamas route early this month

CAB SCHEDULE

Apr 3—Resumption of Colonial Airlines mail rate hearing (Docket 2724)

Apr 3—Oral argument in U S Alaska service case (Docket 4288 et al)

Apr 3—Hearing on enforcement action against National Travel Club Inc Postponed from Mar 27 (Docket 4184)

Apr 10—Hearing on Twin Cities-Washington and Detroit-Washington through-service investigations. (Docket 3861)

Apr 10—Hearing on Florida-Bahamas service (Docket 3824 et al)

Apr 17—Hearing on CAB's enforcement action against Arrow Airways Postponed from Mar 27 (Docket 4154)

Apr 17—Hearing on enforcement action against Trans American Airways Great Lakes Airlines Golden Airways Edward Ware Tabor and Sky Coach Airtravel Inc. (Docket 4161)

May 1—Hearing on CAB's enforcement action against Peninsular Air Transport, Associated Airlines Agency and National Air Coach Systems (Docket 4084)

June 12—Hearing on applications of TWA and American Overseas Airlines to suspend service at Philadelphia on trans-Atlantic flights. (Docket 4228 et al)

June 19—Hearing on CAB investigation of Northeast Airlines tariff practices and uncertificated operations of Fly Freight, Inc, and Sterling Freightways. (Docket 4296)

LETTERS

Recognition

In the Mar 6 issue of AVIATION WEEK there is an unsigned article "Why Crash Protection is Needed," with a footnote stating that the article is "based on a paper" by the undersigned, presented at the recent 18th annual meeting of the Institute of the Aeronautical Sciences

Upon reading the article, however, I find that it is not "based on" my paper but is, in fact, a reprint of the paper with some sections omitted. Aside from the deleted sections the only departures from the original text are a few minor editorial changes in wording, some changes in paragraphing, and the deletion of most of the references.

Early in February, a member of your staff had telephoned me requesting permission to publish my paper, stating that the Institute of the Aeronautical Sciences had agreed to your publication of the paper. I gave my permission and on Feb 14, met with your staff man in your offices and discussed, among other matters, the material to be deleted from the manuscript to meet your space limitations. At that time I agreed to the suggestions made.

Consequently I had expected the publication of the paper in the form in which it appeared; however, I had also expected due credit for authorship. The paper is published as though it were an article by a staff writer, based on my paper. It is my opinion that since the entire text is my writing, I should have received a by-line and the footnote should have stated that some sections of the paper had been deleted because of space limitations.

I cannot but believe that the omission of a by-line was the result of either error or oversight; nevertheless I believe I am entitled to recognition from AVIATION WEEK for the authorship of the paper.

WILLIAM I STIEGLITZ
Design Engineer—Safety
Republic Aviation Corp
Farmingdale, L. I., N. Y.

(AVIATION WEEK certainly intended no slight to Republic's Stieglitz. His paper was chosen for publication among many other papers in our office at the same time. We do not use by-lines on articles which our own staff briefs. We feel that by-lines on shortened papers may be considered unfair to the writers. It is for that reason that we use footnotes stating that the particular article is "based on a paper by . . ." —Ed.)

WHAT'S NEW

New Books

"The Magic of a Name," by Harold Nockolds, is the story of Rolls Royce from its humble beginnings to the industrial organization it is today. The author is to be congratulated for presenting this important slice of aviation history in terms of the human equation, the men who founded the company and those who carried on the traditions of fine engineering and workmanship now associated with the name. Some parts of the story read better than fiction.

One of the best told tales is how the company got ready an engine for the 1929 Schneider Trophy Races in seven months. Taking the H (Buzzard), which turned out 925 bhp., Royce and his engineers developed it to turn out 1900 bhp at 2900 rpm. with 12½-lb. boost. This engine, in the Supermarine S.6, won Britain the trophy with an average speed of 328.63 mph.

Ably presented is the ding-dong battle between Rolls Royce and its German contemporaries to beat each others' efforts during the last war, culminating in the introduction of the turbojet.

Illustrations consist of color plates from original paintings by Roy Nockolds.

Published by G. T. Foulis & Co., Ltd., 7 Milford Lane, Strand W.C. 2, 283 pages, price 25 shillings.

Trade Literature

"World Directory of Scheduled Common Carrier Airlines," prepared by the foreign air transport division, Bureau of Economic Regulation, lists 233 airlines, of which 178 are foreign, 55 are in the U. S., including 15 Alaskan carriers. Copies are available from Publications section, Civil Aeronautics Board, Washington 25, D. C.

Booklet, "Our Story in Pictures," describes and illustrates operations of American Non-Gran Bronze Co. in precision machine work, bronze and centrifugal castings, and the company's own products. Outlined are several production problems the company has helped solve. Write American Non-Gran Bronze Co., Berwyn, Pa.

Catalog gives economic savings possible in using the Anchor Bushing method compared to conventional drill tooling, how to make or change an Anchor Bushing template and has engineering design data and photos of Anchor Bushing drill templates in use. Write The Hi-Shear Rivet Tool Co., Hermosa Beach, Calif.

ADVERTISERS IN THIS ISSUE

AVIATION WEEK—APRIL 3, 1950

EDITORIAL

Congratulations To Aviation's Forgotten Men

It's the smartly uniformed flight crews and the reservations people meeting the flying public who get the layman's credit for running the airlines. The maintenance worker and his boss are the forgotten men.

But the maintenance crews prefer it that way. Keeping the nation's airline fleet of nearly 1100 big transports functioning safely and on schedule doesn't make news. Headlines about mechanical failures are surprisingly rare these days. That means the forgotten men are digging away at the correction of malfunctioning items, solving mechanical problems, providing ingenious solutions to win man's perpetual battle with the machines of his own creation.

There are few industries that have been so extremely competitive as our own domestic airlines. Airline A was willing to spend literally thousands of dollars extra—as a matter of pride—to have right-hand instead of left-hand passenger doors on its new transports. Airline B insisted on scores of changed items instead of getting together with Airline A to save manufacturing costs.

But among the airlines' maintenance departments there has been no such petty business. There has been no secrecy or monopoly of ideas that promote safety. There are no patents on new methods of overhaul or preventive maintenance. Ideas have been given freely to competitors.

There is no better proof of this than the annual Engineering and Maintenance Conference of the Air Transport Association. This year's sessions open in Kansas City this week. For three days, with three simultaneous meetings underway all of every day, ideas will be flying thick and fast, without formality, among representatives of airlines, airframe, engine, oil and other supplier companies.

This annual meeting is a valuable complement to the ATA Engineering Division's daily air mailed maintenance reports covering every equipment malfunctioning, no matter how minor. The material for these reports is telegraphed from the regional CAA offices to CAA's Washington headquarters, which turns them over to ATA for quick distribution to all airline members of ATA. Each airline makes it own daily report to its regional CAA office.

Maintenance, and its importance, has always been taken for granted in aviation. That's why the public sees so few statistics to prove how seriously the airlines do take it. Better and more frequent information on the infinite pains maintenance departments take would increase public confidence even above the high point the airlines enjoy today.

Speaking personnel wise, AVIATION WEEK's Yearbook reported that of 60,416 domestic scheduled airline employes in 1948, 16,428—or 27.2 percent—were mechanical employes.

Economics wise, 1948 CAB records indicate that of total expenses of $423,345,000, the airlines spent $82,065,000—or about 19.4 percent—on maintenance. This was the largest single cost item, except for 25.2 percent spent on direct flying operations.

And results prove the value of such pains. Despite the tremendous problems inherent in breaking in new, post-war aircraft of unprecedented size and complexity, and establishing new training procedures, mechanical causes during the winter are as low as 20 percent among reasons for delay. Old man winter is still No. 1.

These meetings started in 1936 and were held twice yearly for about 50 delegates. In those days the industry was so small that all 50 persons could gather in the same room and discuss all kinds of engineering and maintenance problems in detail.

This week's meetings will comprise continuous sessions on specialized problems of engines, electrical systems, hydraulics, propellers, instruments, fuel and oil systems, ground servicing.

This year's attendance will run close to 500.

Each year a general chairman is selected plus chairmen to conduct each of the individual sessions. The official membership of the conference comprises two representatives from each airline. One is a maintenance man, the other an engineer. Representatives of foreign airlines are welcomed, and every year some attend.

Last year's meeting attracted 465 persons, of whom 135 came from member airlines, 9 from foreign lines, 60 from airframe, engine and propeller makers, 117 from other manufacturers, 37 from the government and 107 from various other organizations and firms. Nearly 100 companies were represented.

"Many industry people feel that the unofficial aspects of the annual conferences are fully as important as the official aspects," Allen W. Dallas, director of ATA's Engineering Division, and secretary of the conference, points out.

"It is the one time each year that all maintenance and engineering people for the industry gather, and the great deal of extra-curricular activity and discussion is of considerable benefit to all attending. Numerous manufacturers arrange exhibits in their own rooms and hold private business sessions with their customers and potential customers."

These annual clinics of aviation's maintenance men have won an outstanding role in the industry's perennial effort for greater public safety.

Robert H. Wood

FIRST in high power, low weight and SPACE SAVING!

Allison has developed a world's "first" in the new T40 Twin Turbo-Prop—an engine which, for its horsepower, is the lightest-weight and smallest-size propeller-type power plant ever cleared for flight.

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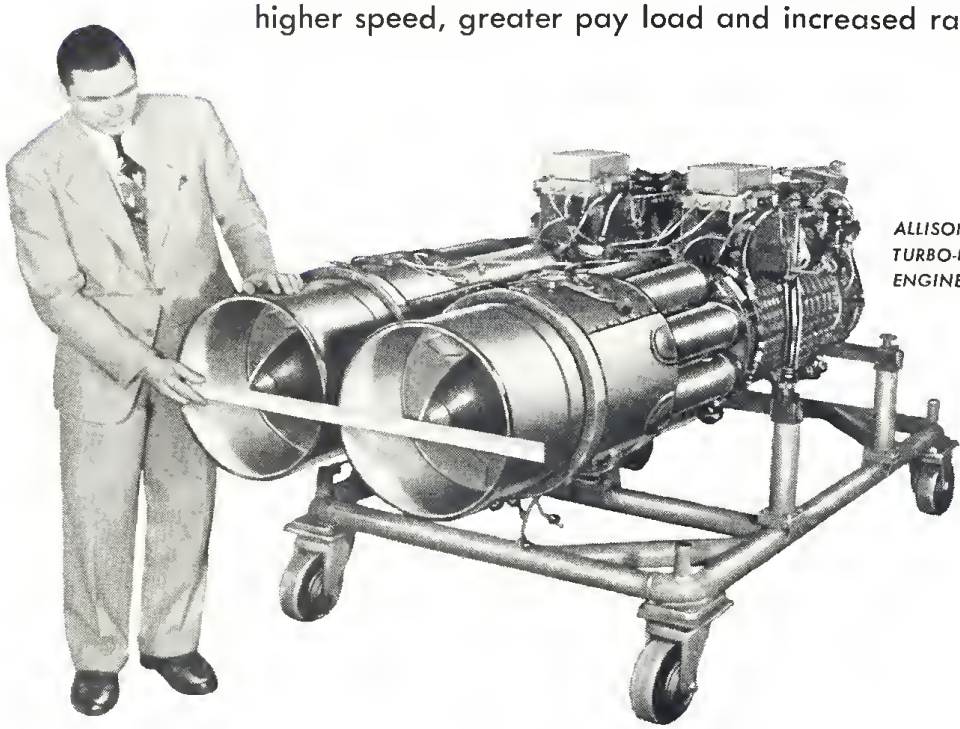

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